

THE TRANSPORTATION-LAND USE INTERACTION

INTRODUCTION

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Can transportation investments be used to influence land use and urban form? Do these investments have as significant an effect on the urban landscape as the land-development market, economic competition among neighboring jurisdictions, and other forces? What do the answers to these questions suggest about the likely success of current transportation policies aimed at slowing the growth in vehicle miles traveled, reducing fuel consumption and pollutant emissions, or increasing access to jobs? Are there more promising ways to achieve these objectives?

Access to efficient transportation has determined the location of cities throughout the ages, and the arrangement of transportation facilities, buildings, and public spaces is the preeminent element of urban design. The timeless debate about the interaction between transportation and land use continues today, but increasingly that debate is less about transportation or land use per se and more about how the combination of the two affects environmental quality, economic growth, and social equity. When viewed in this context, the interaction becomes more important and considerably more complex.

As transportation professionals, we are particularly concerned about the extent to which transportation investments and regulatory policies can influence land use decisions and help achieve various environmental, economic, and social goals. Few issues attract more controversy in the field. In the brief pieces that follow, six authors—three academic researchers with expertise in urban plan-

ning, a vice president of an economic consulting firm, the managing director of a real-estate advisory firm, and a program director of a nonprofit environmental organization—present their views on the connection between transportation and land use.

The authors approach the topic from different perspectives but generally agree that transportation-land use interactions are important, perhaps critical, to understanding the development of metropolitan areas. Further, they generally support research, the development of better analytical models, and decision-making that more explicitly recognizes the transportation-land use interaction, related public policies, and various social goals.

Not surprisingly, they differ in their views about how current public policies should be interpreted and changed in light of our current understanding of the transportation-land use connection and related issues. Congestion pricing, transit investments, land use planning, and land use controls are cited, as are the need for expanded housing and employment choices and creating more diverse forms of development. Taken together, the following essays illustrate where current debate is centered, and they underscore the need to be precise about not only the policies that are proposed but also the problems that are to be solved and the goals that are to be achieved.

Comments from readers on the perspectives offered here are invited.

EDITOR'S NOTE: TRB's Transit Cooperative Research Program recently released TCRP Report 16, *Transit and Urban Form*. This two-volume report provides a wealth of planning and operational data on the relationship between transit and urban form. Public policies used by various urban areas to shape the built environment are analyzed, and a guidebook for practitioners is included.

The following articles are part of the TR News Point of View series in which opinions by contributing authors on transportation issues are presented. The views expressed do not necessarily represent those of TRB or TR News. Readers are encouraged to comment on the issues and opinions presented in this series in the form of a letter to the editor.



WASHINGTON METROPOLITAN AREA TRANSIT AUTHORITY

PREMISES AND PROMISES

PUTTING THE TRANSPORTATION-LAND USE RELATIONSHIP IN CONTEXT

As professionals who claim a special expertise in identifying and forecasting trends, planners should be able to identify trendiness in their own field. Research grows in spurts: when a problem reaches a crisis, a key article is written, funding gets redirected, and a literature builds around the precipitating events. This pattern of activity has been observed in research on topics such as advocacy planning and public involvement, environmental planning, growth management, and economic development.

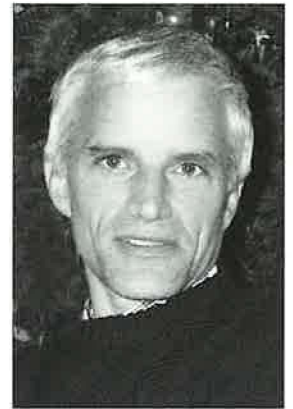
As a topic of professional inquiry, transportation and land use appears to be near the peak of a growth spurt. When I started research on the relationship six years ago, most of the relevant analyses were buried in texts on urban economics, transportation planning, and, to a lesser extent, urban planning. Currently, however, many articles are devoted to the connection between transportation and land use, the problems that each causes for the other, and policies to reduce those problems.

Despite the spate of research, however, most planners trying to deal with the interaction between land use and transportation continue to face one of two problems: either they are confused about the relationship, or they think they are not. The confusion is understandable. The literature only roughly sketches the causal path from some transportation investment or policy (for example, an employer trip-reduction ordinance) through changes in travel behavior (changes in the choice of destination, transportation mode, route, time of travel, and so on) to impacts on other issues about which the public wants planners to care (for example, economic development, environmental quality, community, land use patterns, and prices). Extant four-step transportation models do not deal well with some key relationships, such as traveler feedback on trip generation or the effect of policies on the generalized cost of a trip; land use models are even farther behind. Without such models—without actual measurements of the key relationships to buttress theories about causal relationships—confusion should be expected.

The second problem is that in the face of such complexity or in ignorance of it, planners assume a direct, strong, and singular relationship between the policies they propose and the problems they are being asked to resolve. They may push for minimum-density zoning, for example, on the presumption that zoning drives land use and that high-density housing is better for transportation because it is associated with fewer trips by single-occupant vehicles. But an understanding of the markets for urban land clarifies how complex such interactions are and demonstrates that such reasoning, if carried no further, fails to account for the different socioeconomic characteristics of the population of high-density housing. These characteristics may explain both housing choice and travel behavior. Or planners propose policies to minimize vehicle-miles traveled, although such policies are unlikely to best serve communities. In short, planners often proceed as if they were dealing with a simple cost-minimization problem instead of a complex optimization problem in which several objectives are being pursued simultaneously.

Thus planners must come to terms with the unremitting deterioration of transportation and quality of life in many urban areas and the unresolvable complexity of the forces that cause this deterioration. Is some action required? If so, what set of actions is optimal? Because some policies will lead to results that are more efficient, more fair, or both, action is needed. My overarching advice to planners as they try to answer these questions is to pick premises before promises. Preferred policies depend critically on how problems and causes are defined.

Several of my key premises are shared by many urban and transportation economists. First, peo-



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ple are generally good judges of their individual interests and can be counted on to make rational decisions about housing type and location, place of work, and travel behavior, given their assessment of the relative benefits and costs of different decisions. Second, the market does an adequate

job of matching the demand of consumers to the supply of built space—that is, existing land use is relatively efficient compared with many other allocations one might hypothesize. Third, if the substantial external costs of providing transportation and other urban services were accounted for in price, different land use patterns could result. Fourth, public policy should focus on identifying and dealing with major external costs. Fifth, most mature urban areas have ubiquitous transportation and devel-

opment that policy can affect only marginally and over the long run.

These premises are subject to rebuttal, and they (as well as others one would add or substitute) must be defended to be accepted. The task of

articulating and justifying premises falls to planners in their role as technicians. They must inform the public debate with the best information possible about the severity and causes of transportation-land use problems, as well as the direction and magnitude of the direct and indirect effects of proposed solutions. They must be chary of simple assumptions—for example, growth decreases quality of life; density is more efficient; and relaxing regulations is good for economic development. At the same time, they must tell simple stories about possible futures and defend or amend those stories on the basis of the best understanding of cause and effect that can be extracted from the theoretical and empirical literature.

The transportation-land use connection still matters. Small changes in urban development patterns can be important, both for the direct benefits they create for some neighborhoods in the short run and for the impetus they give to similar and larger solutions in the long run. Moreover, land use and transportation is often the most direct hook into a discussion of what communities want to be. Land use and transportation (and the other public facilities they imply) define a community physically and serve as a focal point for discussions of policies for growth management, economic development, environmental protection, social justice, and quality of life. If such discussions are facilitated by an interest among policymakers and the public in integrated land use and transportation-planning, planners should seize the opportunity.

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WHY THE TRANSPORTATION-LAND USE CONNECTION IS STILL IMPORTANT

The always-complicated relationship between transportation and land use has recently come under renewed scrutiny. Some experts argue that new rail transit investments, public policies favoring transit-oriented development, and initiatives that seek to balance jobs and housing are unjustified. Because urban areas in the United States are already so accessible, settlement patterns are so well established, and maintenance of privacy is so important, they argue, transportation plays an ever-decreasing role in the locational decisions of households and businesses. The inference is that the land use-transportation connection is too weak to matter as a public policy objective.

We believe the land use-transportation connection still matters. Investments in transportation systems strongly affect urban conditions, including land use patterns, urban densities, and housing prices. Although new transportation investments do not shape urban form by themselves, they still play an important role in channeling growth and determining the spatial

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extent of metropolitan regions by acting in combination with policies such as supportive zoning and government-assisted land assembly. In turn, the characteristics of built environments, such as the size and diversity of neighborhoods and the siting of jobs and housing, significantly influence travel demand. Policies that expand travel choices can complement policies that expand housing and job choices.

JOBS-HOUSING BALANCE MATTERS

For every study demonstrating that the jobs-housing balance does not matter, at least as many demonstrate that it does. Some researchers have documented decreasing average commuting times to argue that, in an unfettered marketplace, businesses and households tend to locate in the same areas, making policies to balance jobs and housing unnecessary and perhaps counterproductive.

However, more recent data indicate that, in the wake of rapid job decentralization, Americans are living farther away from their jobs than ever before. The National Personal Transportation Survey showed the average commute distance in the United States increased 2.25 kilometers (1.4 miles) between 1983 and 1990. Moreover, census data reveal that mean journey-to-work times increased from 1980 to 1990 in 35 of the 39 U.S. metropolitan areas with populations over 1 million.

Recent research makes an even stronger case for public policies that encourage balanced growth in jobs and housing. A study of travel in the greater Seattle-Tacoma region in 1989 found that commute distances and times tended to be shorter for those living in areas where the numbers of jobs and housing units are more nearly equal (1). A study using 1990 census data revealed that the share of work trips within the municipal boundaries of 500 cities and towns in Florida increased significantly as the numbers of local jobs and working residents came into balance (2).

Our work largely substantiates the findings from Seattle and Florida. Recent census data for the 23 largest cities in the San Francisco Bay Area reveal that average commute distances are shortest in the cities with high shares of resident workers and that these workers more often use alternatives to the car. Cities with high housing prices (relative to earnings) tended to have a proportionally large share of nonresident workers.



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Jobs-housing imbalances are rooted in fiscal zoning that favors housing less than offices, shops, and other land uses yielding high taxes, as well as in the not-in-my-backyard (NIMBY) attitude that more housing means more traffic and crowded schools. Although the numbers of jobs and housing units in bedroom communities of the San Francisco Bay area became more balanced between 1980 and 1990, supporting the hypothesis that businesses and households locate in the same areas, jobs in nearly all the job-rich cities of the area increased during the same period, supporting the fiscal zoning and NIMBY hypotheses.

Perhaps the term "jobs-housing imbalance," is a misnomer. Problems occur when job-rich communities keep out housing to the detriment of the region at large. When housing for the local workforce is unduly limited near work centers, policies are needed to correct the planning, not market, failure. Policies supporting a jobs-housing balance attempt to break down zoning and NIMBY barriers to residential mobility; they do not seek to mandate where people live and businesses locate.

RAIL TRANSIT AND HOUSING PRICES

If, as some critics contend, transportation investments have so little effect on land development, then rents and property values will remain roughly the same following these investments. However, recent studies in Washington State and Phoenix, Arizona, reveal net increases in property values once new highways opened, although accessibility premiums were offset by noise-related price reductions in the homes closest to the highways.

To our knowledge, no study to date has compared the price effects of both highways and rail transit. We sought to do so by analyzing the effects of nearby highway interchanges and rail lines on the 1990 sale prices of 4,180 homes in the California counties of Alameda, Contra Costa, Sacramento, San Diego, San Mateo, and Santa Clara, statistically controlling for home size and age, lot size, neighborhood-income levels, home ownership rates, and racial composition.

We found that proximity to highway interchanges lowered the price of homes. For every meter a home is closer to a freeway, its price drops \$2.80. By contrast, sale prices tend to increase with proximity to the Bay Area Rapid Transit (BART) and San Diego light rail systems. In gen-

eral, regional systems that provide reliable and frequent service over a large market area generate the largest price premium, while systems with more limited services and market areas generate the least capitalization benefits. Overall, the premiums associated with increasing the density of housing near transit stops are unlikely to be large enough to overcome local opposition to such development, suggesting that local, transit-supportive land use policies may be helpful.

EFFECTS OF RAIL TRANSIT ON BAY AREA DEVELOPMENT

As part of the 20-year update to the original BART Impact Study, we recently evaluated the system's long-term influence on urban form and land use patterns. In one analysis, we compared the effects of proximity to BART stations and freeway interchanges on all land use changes (measured at a hectare grid-cell level) that occurred in Alameda and Contra Costa between 1985 and 1990, a period of accelerated land development in both counties. Using statistical models that controlled for topographical constraints, zoning policies, adjacent land uses, and development opportunities, we found that proximity to BART had a particularly strong influence on the likelihood of sites being redeveloped. All other factors being equal, residential sites near BART stations were far more likely to be converted to commercial or industrial uses than were more distant residential sites. Highway access, by contrast, had little effect on redevelopment activity.

In another study, we used shift-share analysis to measure employment growth differentials between the 35 zip-code areas with BART stations and the remaining 117 zip-code areas without stations in the three counties served by BART. The BART zip-code areas gained 139,400 jobs (a 30 percent increase) between 1981 and 1990, accounting for 57 percent of the employment growth in the counties. Most of this growth occurred in downtown San Francisco, suggesting that BART helped to slow the exodus of employers from the region's employment hub.

Outside downtown San Francisco, job growth and land use changes around BART stations have varied. Downzoning, NIMBY resistance, and weak local real estate markets have impeded new development in some areas. Where these barriers do not exist, a sizable amount of new development has sometimes occurred. In these areas, local governments have encouraged development through initiatives to assist land assembly and finance

transit-supportive infrastructure such as public plazas and sidewalks. Under the right circumstances then, BART has proven to be an important contributor to land development.

STRENGTHENING THE LAND USE-TRANSPORTATION CONNECTION

The land use-transportation connection still matters because there remains considerable elasticity in the relationship. By themselves, land use initiatives, such as policies favoring a jobs-housing balance or transit-supportive development, are not panaceas for reducing congestion, air pollution, or social equity problems. But neither are road expansions, tollways, ridesharing, or a host of other demand-management measures. Any single policy response exerts only a marginal influence on regional traffic or environmental conditions.

Granted, proper price signals passed on to motorists and parkers would shape travel behavior more than any single policy strategy, including land use initiatives. Given today's distorted transportation marketplace, we are not surprised that the coordination of transportation and land use programs has to date yielded suboptimal outcomes. However, this is an indictment of pricing policies, not land use planning.

Proper pricing, such as congestion fees and mandatory parking charges, would likely eliminate the need for efforts to balance jobs and housing or build transit-oriented communities. People would move closer to jobs and transit stops to economize on travel. In a pluralistic, democratic society such as ours, however, true market pricing of transportation might be less attainable than

strengthening transportation-land use linkages. Only Norway, whose population is small and homogenous, and Singapore, an island-state with near-autocratic planning controls, have adopted forms of road pricing.

Martin Wachs, chairman of the Transportation Research Board Committee on Congestion Pricing, has concluded that except for "professors of transportation economics and planning—who hardly constitute a potent political force, I can think of few interest groups that would willingly and vigorously fight for the concept." In the absence of true market-based pricing of transportation, public initiatives that help strengthen the land use-transportation connection are among the next best actions.

REFERENCES

1. Frank, L., and G. Pivo. The Impacts of Mixed Use and Density on the Utilization of Three Modes of Travel: The Single-Occupant Vehicle, Transit, and Walking. In *Transportation Research Record 1466*. TRB, National Research Council, Washington, D.C., 1994, pp.44-52.
2. Ewing, R. *Best Development Practices: Doing the Right Thing and Making Money at the Same Time*. American Planning Association, Chicago, Ill., 1996.

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TRANSPORTATION, LAND USE, AND PUBLIC POLICY



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Transportation planners and policymakers have been consistent critics of suburbanization and decentralization. They argue that metropolitan expansion wastes land, energy, and other natural resources; promotes dependence on cars; and spatially divides people along racial and ethnic lines. Critics of current land use patterns place much responsibility on automobiles and highways, seeing a direct link between highway investment (particularly in the Interstate highway system) and large-scale suburbanization. The assumption is that focusing transportation policy on mass transit instead of highways will reconcentrate development, revitalize central-city areas, and reduce automobile use.

Can we restructure our urban areas by investing in mass transit? If we did, would we solve our social and environmental problems? The answer is probably no.

OTHER FORCES IN DECENTRALIZATION

Transportation improvements can only affect land use when changes in accessibility are sufficient to generate changes in travel patterns. Rail transit (primarily streetcar systems) was a strong decentralizing force, allowing cities to expand along commuter lines. The automobile and truck subsequently made more extensive decentralization possible.

These changes were not inevitable. Post-war suburbanization was supported not only by the Interstate system but by

policies that have kept car and fuel prices low, federal tax and mortgage policies that have favored suburban development, and policies that have enabled suburban residents to avoid the social and fiscal problems of the inner city. These policies enjoy strong popular support as congressional response to the most recent surge in gasoline prices clearly demonstrates. Changes in industrial

technology that has favored horizontal manufacturing structures, coupled with shifts to service-sector activities that do not rely on central location, have also contributed to suburbanization. In addition, cultural values that idealize the countryside and the single-family home as well as private property rights have played a role in this phenomenon.

TRENDS SUGGEST MORE OF SAME

Today's metropolitan areas are extensively decentralized, and all indications are that the process will continue. Information and telecommunications technology has greatly increased the flexibility of economic activity, a trend that is expected to intensify. This technology has made possible the development of spatially distributed production systems that take advantage of low-cost suppliers no matter where they are located. Employers are also using more temporary and home-based workers, and self-employment is increasing rapidly. These changes are reducing the value of agglomeration as in the traditional downtown or employment center. Such locations are of little value when information can be exchanged instantaneously through a variety of media and when access to the labor force is ubiquitous.

At the same time, these changes suggest that individual mobility has increased in importance. Our traditional image of the commuter—an individual who chooses home and job locations in some optimization process that includes minimizing the burden of the daily journey to work—is becoming irrelevant. Today's worker must respond to more frequent job shifts and more flexible work arrangements and so will rely increasingly on the automobile.

TRANSIT POLICY CANNOT CHANGE TRENDS

Those who are concerned about continued decentralization and want to promote higher population densities and more clustered development patterns are generally strong advocates of rail transit investments. Rail transit is viewed as a potential

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force for reconcentration: with the right combination of supportive land use policies and market conditions, transit stations can become centers of high-density, mixed-use development. Such benefits are evident in downtown San Francisco and Washington, D.C. If it worked in San Francisco and Washington, will it work in Miami, Dallas, or Los Angeles?

First, although downtown San Francisco benefited from the Bay Area Rapid Transit (BART) system, downtown Oakland and many other locations along BART lines did not. Despite large subsidies for downtown redevelopment and other supportive policies, BART has had little effect in downtown Oakland. Downtown San Francisco enjoys many amenities that make it a vibrant urban center. BART gave the area an additional boost by increasing access to the labor force. Downtown Oakland does not have the same attraction. Although it has no shortage of local labor or developable sites, these assets are insufficient to promote new development—with or without BART.

Second, rail transit is a costly way to influence development patterns. Transit investments generally have little effect on accessibility. A new transit line, for example, decreases travel times for only a small share of the many trips made within a metropolitan area, yet costs hundreds of millions of dollars to build and requires large operating subsidies. In Los Angeles County, for example, budget shortfalls generated by the high subsidy cost of subway service have been met by reducing bus service and increasing transit fares. In the unlikely event that the county's new Red Line attracts new development to downtown Los Angeles, county taxpayers and bus riders may well ask whether this development was worth the price.

Third, rail transit has no effect on the underlying forces of decentralization. Transit investment does not influence exclusionary land use policies, local fiscal policy, or the price of owning and using an automobile. It also does not affect the larger economic changes noted earlier. Although the right combination of local support, federal subsidies, market conditions, and other factors can sometimes bring about the desired outcome, most efforts are bound to fail because of these more powerful forces.

THE BIGGER PICTURE

The premise of efforts to use rail transit to direct land use is that decentralization is an efficiency and social equity problem that requires policy intervention. But is it?

Studies of the relationship between decentralization and commuting patterns yield conflicting findings regarding efficiency. The intermixing of jobs and population that has accompanied decentralization may lead not only to shorter commutes but also to more use of private transportation. Higher density may not only reduce the distance of commutes but may also decrease travel speeds and increase congestion. The real problem is the way transportation services are priced. Private transportation users do not pay directly for the parking spaces they use, the pollution they generate, or the traffic congestion to which they contribute. They do, however, pay the developed world's lowest private transportation fees, such as gasoline taxes. Not surprisingly, efforts to use transit policy to reduce the use of cars have been unsuccessful.

The social equity problem arises because higher-income households, which are able to pay the higher costs of commuting, move to the suburbs to form communities that are fiscally independent of the central city. Meanwhile, exclusionary land use policies spatially divide urban and suburban populations on the basis of income, ethnicity, and race: people most in need of public services concentrate in the central city, and the tax base there declines. Investing in rail transit and trying to restructure the pattern of urban land uses will not solve these problems.

Our dilemmas concerning transportation and land use policies are rooted in our confusion about what can reasonably be accomplished with changes in policy and in our unwillingness to directly address our social and environmental problems. If the aim is to reduce the environmental damage generated by automobiles, the effective remedy is to directly price and regulate car use, not land use. If the aim is to reduce the spatial division of metropolitan areas along the lines of income, ethnicity, and race, the effective remedy is to expand the range of housing and employment choices, not travel choices. As urban areas continue to evolve, the link between land use and transportation will probably continue to weaken. Only direct policy intervention can solve the social and environmental problems associated with existing travel and land use patterns.

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STANDARDIZING THE AMERICAN DREAM



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Today's marketplace for real-estate development plays a major but often overlooked part in the dynamics of transportation and land use. This marketplace reinforces conventional U.S. development patterns, which are driven by ubiquitous automobile ownership and demand for parking. The homogeneity of these patterns, resulting in a geometric expansion of land use compared with underlying population growth, is attributable to a relatively small set of now-standard formulas for construction. Small wonder then that most metropolitan areas have a similar design character and are environmentally and economically unsustainable.

Understanding current patterns of land use and formulating alternatives should begin with an appreciation of the new realities of real estate finance. The U.S. real estate industry invests more capital—approximately \$9 trillion—than any other industry in the economy. Because of poor performance in the late 1980s and early 1990s, however, the real estate community is no longer trusted to use such vast sums of money without strict controls. Professional money managers and investment bankers are becoming the gatekeepers for capital-investment decisions regarding real

estate. This change favors types of construction that have proven successful in the past, reinforcing formulaic development.

Today money managers can quickly and inexpensively finance only about 18 types of

construction. Formulas for these products include neighborhood centers of between 7432 and 13 935 square meters (80,000 to 150,000 square feet) that are anchored by grocery or drug stores, have surface parking, and are designed to serve residents within a 3- to 6-kilometer (2- to 4-mile) radius. Other formulas are 2- and 3-story rental apartments of between 100 and 500 units with surface parking or, increasingly, attached garages, and move-up detached housing of 0.13-hectare (0.3-acre) lots with houses of between 167 and 279 square meters (1,800 and 3,000 square feet).

For offices, there are 2- and 3-story buildings, measuring between 4645 and 9290 square meters (50,000 and 100,000 square feet), with surface parking, in outer suburban locations. Other formulas for commercial products include 1-story, 9290-plus square-meter (100,000-plus square-foot) warehouses with a 6.7-meter (22-foot) or higher clear-span height and laser-leveled floors to accommodate automatic storage and retrieval systems, and "power centers" made up of many "big box" retailers and surface parking designed to serve residents within a 4.8- to 8-kilometer (3- to 5-mile) radius.

These formulas change somewhat in size and character with the pressures of supply and demand, but they also accelerate the trend toward a homogeneous built landscape. As standardization is codified by the real estate finance community, local input and control diminishes. With the possible exception of superficial architectural details, an apartment in Atlanta looks like one in Los Angeles; a housing subdivision in Kansas City looks the same as one in Orlando. The ever-present commercial strip, probably the most significant American contribution to 20th-century architecture, has led to biting commentaries, including *The Geography of Nowhere* by James Kunstler, who called the built landscape of the United States a "hostile cartoon environment."

How are Americans reacting to the formula-driven environment being created across the country? Visual preference surveys by Princeton-based planner Anton Nelessen reveal that many people consider conventional, formula-codified development to be an evil. In what may appear to be a blinding flash of the obvious, Nelessen has consistently shown that pedestrian-oriented village retail is overwhelming and consistently preferred to eight lanes of traffic separating the big discount retailer from the fast-food purveyor.

Given the apparent antipathy toward current real-estate development patterns, how can we account for our acceptance of them? One explanation from critics of conventional development patterns, such as Peter Calthorpe, a leader in the New Urbanism movement, is that few alternatives to current cookie-cutter products exist. This expla-

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nation is bolstered by the public's fondness for places that do not resemble such products: commercial areas and neighborhoods built before World War II, such as Country Club Plaza in Kansas City, Missouri, the German Village neighborhood in Columbus, Ohio, and the Upper East and West Sides of Manhattan. Elected officials or developers who attempt to change the character of these places do so at their own risk.

Another explanation for the apparent acceptance of current real estate development is that it represents attempts to realize what Anthony Downs of the Brookings Institution has defined in *New Visions for Metropolitan America* as the post-war American dream—"a home in the suburbs, a car, good schools, responsive local government." As Downs notes, the realization of this dream "threatens the long-run viability of American society." This is because the sum of decisions by individuals, families, and businesses to maximize their own benefit—whether it be convenience, safety, efficiency, or privacy—has led to traffic congestion, air pollution, rising taxes for deferred infrastructure, the loss of nearby open space, and the segregation and concentration of the poor, which in turn results in geometric increases in and pervasive fear of crime. Collectively, these unintended consequences make up a phenomenon known as the "tragedy of the commons." This tragedy, which originally referred to the overgrazing of community-owned lands in England, today signifies the less-than-optimal combined results of individual efforts to maximize benefit. The tragedy of the commons suggests to Downs that the American dream is unsustainable and must be replaced.

Perhaps the most important reason for the acceptance of current real-estate development pat-

terns is that Americans have traded character for efficiency. In retailing, for instance, commercial strips allow U.S. consumers to spend far less on food than consumers in the rest of the industrialized world. Discount chains can afford to offer a wider selection of goods at lower cost than the old 5 & 10. And homes in the United States are far larger for the same or lower cost. In short, standardization of our real-estate development has led to significant cost efficiencies.

Realization of the new American dream will require many more than 18 codified products that can be easily and inexpensively financed and developed. These new products must reflect a sense of community and be environmentally sustainable yet not lose standardization's inherent cost efficiencies, which increase affordability. And these new products must be evaluated in the context of the community and metropolitan area in which they will be located. Such evaluation will require education, political consensus, and new decision-making mechanisms that demand a level of planning and approvals rarely accepted in the past. However, the real estate industry, the ultimate collection of can-do optimists, can prosper under this new regime, particularly if the rules are clear and certain.

Our development patterns will have to be significantly modified. The answers to how we modify them are just now becoming apparent. The only question is when the new version of the American dream can be formulated and codified.

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INTEGRATING THE ENVIRONMENT AND LAND USE INTO TRANSPORTATION DECISION MAKING



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For many years the process of transportation decision making went something like this: examine current road capacity, projected growth, income, car ownership, and vehicle trips and miles, and, using tried-and-true gravity models, determine how many new lanes or road miles are needed to satisfy demand. Identifying the site of the new construction was a function of mixing these technical analyses with political considerations. After passage of the National Environmental Policy Act in 1969, environmental effects had to be considered when federal money was being used; but site selection remained, for the most part, a pro forma process involving the examination of alternative routes for comparative impacts within fairly narrow corridors. Serious analyses of environmental effects and adequate explorations of alternatives to proposed new roads were not often undertaken. Throughout the decision-making process, states were the strong transportation players and local governments the strong land use players.

As environmental regulation has increased, a wider variety of environmental factors has gained prominence in site-selection efforts. Thus, as the regulatory regime outlined in sections 401 and 404 of the Clean Water Act matured in the late 1970s and in the 1980s, additional analysis of wetlands effects has been required in site selection. Again, for the most part, such analysis revolved around the choice of alternative alignments, although mitigation of environmental damage also became a regular part of decision making.

Interest in modifying this process is increasing in light of arguments about the precise relationship of transportation and land use, questions about the validity of modeling that relationship and our capability for doing so, and attempts to more cogently evaluate transportation alternatives. Indeed, two sets of circumstances point to the dawn of a new era for transportation decision making: the flow of imperatives from the Intermodal Surface Transportation Efficiency Act

of 1990 and the Clean Air Act Amendments of 1991, and the changing realities of transportation planning. In the 1990s these realities are strident and effective opposition to business-as-usual planning; fiscal constraints imposed by shrinking federal contributions and declining state-funding capacities; new analytical tools for evaluating transportation alternatives; and a better understanding of the interactions among land use, transportation infrastructure, and the environment. A quick review of these interactions will suggest several principles that should inform a new model of transportation decision making at the regional and state levels.

The relationship between land use and the environment is both direct and indirect. The effects of the direct relationship are observed when natural habitats are displaced as a result of human activities—for example, the clearing of land or drainage of wetlands for the construction of homes, the introduction of non-native plant species, and so on. Even low-density urban development—for example, one dwelling per 0.9 to 1.8 hectares (1 to 2 acres)—can diminish the ecological value of land. A lawn is a poor substitute for a forest or a wetland, ecologically speaking, because it replaces a natural habitat that supports biological diversity with a land use that reduces such diversity.

The effects of the indirect relationship are observed when urbanization in one area leads to environmental problems in other areas. Again the consequence can be the loss of ecological services, such as natural flood control. As land is developed, its surface becomes more impervious to rain. As a result, storm water moves along the surface of the ground instead of percolating through the soil to recharge aquifers. Pollutants picked up in this runoff are deposited in urban streams and eventually in tributaries far downstream. These nonpoint-source pollutants include chemicals used in lawn care and agricultural production and the toxic products of streets and parking lots, such

as heavy metals, rubber and petroleum compounds, and asbestos from brake linings.

The environmental effects of low-density urbanization, or sprawl, are worsened by transportation construction. The only way to provide mobility to people living far away from where they work, shop, and go to school is to build an extensive network of roads, which will be traversed chiefly by single-occupant vehicles. Because their surfaces are impervious to water, these roads are a source of storm-water pollutants. They also provide the medium for the generation of mobile-source air pollutants.

In some urban regions of the country, motor vehicles are responsible for a significant proportion of air pollution. In the metropolitan Washington, D.C., region, which exceeds the ozone limits specified in the Clean Air Act Amendments, emissions from vehicles are a major source of nitrogen oxides. These oxides photochemically combine with volatile organic compounds to create ozone, which can pose a human health threat. The nitrogen compounds that help create ozone also diminish the capacity of water to support fish and vegetation. High levels of nitrogen in the air lead to higher-than-optimal levels of nitrogen in water bodies, dramatically increasing the growth of algae, which deplete oxygen from water and (in sufficient quantity) starve other aquatic life. Nitrogen, of which motor-vehicles emissions are a significant source, is one of the major threats to the health of the Chesapeake Bay.

Although transportation systems cannot in and of themselves cause sprawl, they can, in the presence of other conditions, promote it. At the same

time, land use affects transportation: moderately dense, mixed-use patterns can accommodate transit systems, encouraging nonmotorized travel, and sprawl can, under the right circumstances and growth conditions, overwhelm road improvements.

Where does all this lead us? First, we ignore or trivialize the land use-transportation-environment link at our peril. It provides rather significant imperatives on all three fronts. Second, our models for planning and decision making need to be changed to improve analysis of the connections among alternative means of access and mobility, demand management, and land use. Public involvement is a crucial component of such reform because citizens need to be apprised

of the full environmental and other social costs of various transportation options if they are to make informed choices among them. Without an understanding of these costs, consensus on the choices will never be reached. Finally, we need to think and be willing to act in nontraditional ways. Traditional systems of analysis and action have brought us to an impasse from the perspectives of both the environment and transportation systems. I am convinced that more closely connecting local land use with transportation decision making and policymaking at state and regional levels can improve transportation, land use, and environmental outcomes.

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