Does Transportation Finance Influence Urban Form?

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There is no "silver bullet" solution to ameliorating the by-products of inadequate and inefficient public sector investment in transportation facilities. In recent years, public policy and the literature have given much emphasis to increasing private sector participation in transportation facilities. Techniques to blend public and private resources optimally, as well as to create incentives for rational project design and selection, are needed. This paper is written from the perspective of a practitioner in the field, rather than as a scholarly review. As a result, it tends to draw observations from experience more than from the current literature. These experiences include serving as a principal in a large urban office development, a land developer (perhaps speculator is more appropriate) in suburban locations, a consultant to public agencies on project finance and policy, and a strategic planning analyst for public transportation agencies.

The first section considers the relationships between transportation and financing factors on land use. The second explores recent experiences with private sector financing. The final section raises questions pertaining to allocating available resources and establishing directions for future research.

THE EVOLVING TRANSPORTATION–LAND USE LINKAGE

As the many highway interchanges that have yet to attract a convenience store or the many rail stations surrounded by vacant lots indicate, a host of factors influence the location and form of development in addition to transportation capacity and the means to finance it.

This personal observation finds confirmation in a limited review of recent studies. In Giuliano's excellent literature synthesis, there are several supporting conclusions (*1*, pp. 16, 19):

> Today's metropolitan areas are characterized by a well developed transportation system and a highly decentralized pattern of land use. These characteristics have reduced accessibility-related differences between locations, which have in turn weakened the transportation–land use linkage.
>
> . . . The transportation system in most urban areas is highly developed. The relative impact of even major investments (for example, a new freeway segment) on accessibility is generally minor, and therefore their impact on urban form will likely be minor as well.

Giuliano finds that declining transportation costs have resulted in more dispersed urban development and that the scattering of both jobs and housing has reduced the significance of transportation in location decisions of households and firms. More important, even substantial increases in transportation costs were not expected to alter the decentralization process, and were anticipated to be offset by shifts in travel patterns and technological advances.

If the transportation–land use linkage is weakening as a result of the maturing, high-quality access network, then the value of particular transportation improvements to a private entity will not be as great and the willingness (or ability) to enter into cost-sharing arrangements will be reduced as a consequence.

In an assessment of the influence of road investment on economic development, the Public Policy Center of the University of Iowa and the Midwest Transportation Center (*2*) reviewed a number of studies that reached parallel conclusions (*2*, pp. 29, 32, 34, 35, 39):

- Transportation investment may be a necessary but not a sufficient factor for economic development.
- The impact of highway investments today, with a mature highway system, may not be the same as in earlier periods.
- Proximity to a metropolitan area was a better predictor of nonmetropolitan county growth than the presence of major highways.
- The presence of highways had very weak impacts in less developed rural areas.
- Relationships between highways and local development were mainly by association—there was little confidence that highways led to growth, rather than vice versa.
- The economic development process is too complex and the role of transportation is not likely to be sufficiently dominant to allow causal relationships to be established.

- Education, unionization, physical amenities, business climate, energy, and tax rates define a region's developmental prospects to a much greater extent than do highways.

It is important to note that one of the principal conclusions of the University of Iowa investigation was (*2*, p. 29):

> . . . rarely will the high construction costs of adding new regional highways to the nation's highway system be justified, even in less developed areas. A sufficient number of developable sites remain that providing highway access to others is unlikely to advance economic development.

The down side of inefficient resource allocation decisions and improper needs assessments also was observed (*2*, p. 25):

> Investing public funds in highway projects that are not efficient can actually reduce an area's economic development potential. . . . If the cost savings [attributable to the transportation investment] do not exceed the expense necessary to construct and operate a highway, the highway and the increase in taxes and/or user charges that it entails make the area less attractive to mobile resources.

The first set of conclusions tends to minimize the causal effects of transportation improvements on development and indicates a declining value increment attributable to specific transportation projects on adjacent real estate. These findings are consistent with Giuliano's and suggest that expectations for future private sector contributions must be tempered by generally declining marginal benefits of new transportation facilities.

The latter observation regarding the need for solid capital budgeting discipline tends to run counter to the trend toward politicizing the investment decision making process. Investments in facilities that are not necessary or in excess of actual requirements divert funds from high-benefit projects and impose serious opportunity costs. These impacts include artificial constraints on market-supported growth prospects, a long-term fiscal drag from unnecessary maintenance and depreciation costs, and the use of higher-cost (in terms of the cost of capital) private sector solutions to meet priority needs. Building lower-benefit projects still requires imposition of broadly based taxes and user fees that reduce regional competitiveness if not offset by tangible gains in mobility and productivity. Misallocation of resources can occur between jurisdictions (diverting funding from areas experiencing real travel demands to areas where transportation projects are intended to exert a "pump priming" influence), as well as within

jurisdictions (improper project selections or overinvestment in particular facilities).

Kenworthy and Newman (*3*) analyzed gasoline use and the resulting pollution impacts in 32 cities located within the United States, Europe, and the Pacific Rim. They discerned a consistent relationship between various measures of urban form (land use intensity, degree of concentration), transportation system characteristics (automobile ownership, availability of parking, availability of public transit service, amount of roadway space), and energy consumption.

Of interest was the absence of an observed link between the wide variety of transportation financing mechanisms used in the cities studied and urban form. The critical determinants of land use–transportation interactions were feedback loops involving public policy decisions on land use, development densities, parking availability, roadway capacity, and the balancing of transit and highway investments. In fact, the study found evidence that applying highway level-of-service criteria to determine the adequacy of facilities would reinforce trends toward dispersion and automobile dependency. The conclusion is a call for greater attention to a balanced transit and highway investment policy, with supportive land use controls.

These findings reinforce the view that it may be more important to make proper decisions about how and where to spend funds than how to raise them. Similarly, with a mature transportation system in place, land use planning and market processes exert stronger influences on urban form than do transportation finance considerations.

Several recent articles on future development trends reinforce these observations on the land use–transportation linkage. If cities continue to expand their boundaries indefinitely and develop more and more new urban cores, the resulting pattern of dispersion will tend to drive future transportation investments. However, market and political forces seem to be suggesting that this is not likely to be the case and that "in-fill" of current metropolitan boundaries is a more probable outcome. A recent review of development trends in the coming decade by Leinberger (*4*) anticipates a slowdown in outward expansion of urbanized areas driven by the search for cheap land. From a market perspective, Leinberger sees broad availability of sites at all price ranges within current metropolitan boundaries because of the geometric expansion that has occurred over the past 20 years. This view corresponds with the conclusions presented earlier from the Guiliano (*1*) and University of Iowa (*2*) studies, suggesting that the declining marginal development benefits would be derived from further expansions of the highway network.

Leinberger also anticipates that the weak market forces pushing further outward will be blocked by strengthened political initiatives to manage growth and preserve open spaces. These trends will tend to define urban form more than transportation financing techniques will, and suggest the need for better tools to determine where transportation investments should occur and what character they should assume.

As a peripheral observation, it is in fringe locations, where the basic price of land has been sufficiently low and the cost of transportation improvements still modestly priced, that developers in recent years have been able to justify economically what appear to be significant proffers for infrastructure. More limited outward expansion could reduce future opportunities for private projects and increase the need for public-private cost-sharing mechanisms.

New approaches to development also have the potential to minimize transportation requirements and influence urban form directly. Perhaps most significant among these trends is the "traditional neighborhood" approach, which appears to yield substantial traffic reduction benefits (*5*). These site planning and project development approaches do have implications for transportation finance, but more from the perspective of the amount and nature of transport capacity required rather than from the suggestion of particular financing techniques.

The interaction between public and private capital investments in transportation facilities bears consideration as part of the review of evolving land use–transportation linkages. From the standpoint of sheer dollars generated, the bulk of funding to pay for transportation investments comes from broadly based sources—gas taxes, sales taxes, general fund contributions, vehicle registration fees, and so forth. FHWA has estimated that more than $19 billion will be spent on the federal-aid system in FY 1992, with about one-fourth coming from state sources (*6*). The transit industry spends about $15 billion per year on operations, with about one-third derived from operations and the balance from state, local, and federal sources (*7*). The incidence of these broad-based mechanisms tends to affect national (in the case of the federal gas tax) or regional economic forces, rather than specific sites and their form of development. However, even though we have concluded a weakening land use–transportation linkage, expenditure of the proceeds of broad-based financing mechanisms on large scale improvements will have some impact on specific locations.

As a result, relatively small private sector shares can, in many cases, "leverage" much larger investments of public funds. As long

as broadly based financing sources constitute the primary streams of transportation investment capital, the role of private sector capital will remain on the margin. However, allowing the availability of private resources to exert a high degree of leverage in targeting much larger amounts of public funds has the potential either to exacerbate underlying inefficiencies in the capital budgeting process or to act as a guiding factor in directing funds to projects with significant immediate benefits. These divergent possibilities reinforce the need for more sophisticated capital budgeting techniques for project selection and scoping.

In concluding that the means of financing transportation improvements plays a less significant role in defining urban form than do market and regulatory forces, it is necessary to recognize one area in which local government financing mechanisms may be contributing to poor land use decisions and to transportation problems. On the basis of personal experiences in buying and attempting to sell property in outlying areas of high-growth markets, the attraction of many rural areas undergoing initial development has been low-cost land for residential development. In cases where market trends yielded successful residential development, the unfortunate result was demand for costly public services—schools, public safety, libraries, and so forth. Bedroom jurisdictions quickly realized that commercial development was needed to generate property and sales taxes to keep overall tax rates reasonable and still satisfy service demands. As the red carpet for retail, industrial, and commercial development was rolled out, a combination of ad hoc siting, zoning, and development decisions manifested itself in congestion, among other problems.

Caught between the need for tax revenues and the possibility of seeing attractive commercial development locate in adjacent communities, many outlying counties now find themselves in a traffic dilemma. It is possible that regional tax base sharing, regional planning of infrastructure, and regional financing mechanisms could reduce the pressures for tax base competition that may be an underlying factor leading to poor land use decision making and growing transportation demands.

PRIVATE SECTOR PARTICIPATION IN TRANSPORTATION FINANCE

It has been traditional for commercial, industrial, and residential land developers to pay for site-specific improvements, such as parking and

internal streets. In recent years, off-site improvements to upgrade regional facilities and joint developments involving public-private partnerships have emerged as new directions for financing transportation systems.

As the federal highway system has moved toward completion, fewer and fewer miles of costly regional capacity have been brought on stream using the most broad-based financing tool, the Highway Trust Fund. Tax limitation pressures have caused broad-based sources of state and local revenue to lag behind infrastructure investment requirements. The result of these trends has been to place increased pressure on project-specific revenue sources—fees, assessments, and proffers. The evolution of private sector participation, therefore, can be viewed partially as a response to growth-related politics, inadequate tax revenue, and the legal and economic inability of land use regulation to meet popular expectations.

Because of the feverish pace of construction and rapid escalation in land costs in the United States over the past decade, private interests were able to absorb a high level of nontraditional, off-site infrastructure costs, allowing the new approaches to achieve positive results in satisfying public and private needs. Encouraged by imprudently allocated capital were more than a few cases in which the front-end carrying costs necessitated by otherwise public sector investments have helped bring private developments to insolvency. The cost for such off-site regional transportation investments may yet be borne at the federal level; however, the Resolution Trust Corporation rather than the Highway Trust Fund will be debited.

Joint development permits the value created by transportation investments to be shared and plowed back into financing the public portion of the project. It too has enjoyed considerable attention as a financing mechanism, and one that has the potential to influence urban form by concentrating densities at major transportation hubs. Market conditions have affected projects with heavy reliance on joint development as well.

The greatest potential for using project-specific revenue sources occurs in high-growth locations where inadequate funding from conventional sources for regional transportation facilities has contributed to a run-up in land values through constraints imposed under the entitlement and environmental review process. The large "delta" between raw land and entitled sites resulting from negotiated transportation investments is the basis for value-sharing arrangements. Developer contributions can be maximized by combining project-specific financing mechanisms with an accelerated entitlement process. The

down side to applying private sector-oriented financing mechanisms involves tolerating high levels of interim congestion to create pent-up demand, the evolution of a "density for sale" zoning orientation, and a high degree of market sensitivity.

The ability of project-specific financing mechanisms to address rehabilitation and reconstruction needs remains to be determined on a broader scale. At present, the leading example of rehabilitation-oriented public-private partnerships is New York City. Extensive improvements to subway stations have been negotiated through the entitlement process, and it appears that even Donald Trump may help in relocating the decayed Miller Highway. However, the forces of growth are not always strong in areas with extensive reconstruction needs. It is important that the shift in transportation priorities toward rehabilitating existing facilities not leave us formulating tomorrow's solutions based on yesterday's problems.

The needs of a mature transportation system may require different approaches to eliciting private sector participation and could have different implications for influencing urban form. Perhaps the greatest concern is that generating the funds to rebuild the infrastructure of developed areas not chase away jobs and housing from established cities and older suburbs.

The following discussion examines some of the land use benefits and limitations of newer, private-sector-oriented transportation financing tools.

FINANCING MECHANISMS AS PART OF THE REGULATORY PROCESS

The imposition of impact fees, special assessments, and proffers has been woven into the politics of growth management. The willingness of the public to pay for transportation improvements necessitated by growth and changing patterns of travel demand is never high. This fact of life often gives rise to the solution that the forces of growth should pay their own way. A frequent corollary is that restricting transportation investment somehow will limit growth.

In fact, there is no free lunch that allows the private sector to absorb the costs of needed public investment. The reality is that private forces cannot sustain all of the carrying costs of infrastructure required by new development. Land economics and market forces have combined in recent years to demonstrate that matching land sales and absorption forecasts is not an exact science and that large,

front-end carrying costs are a primary factor in real estate financial failures. On the other hand, restricting transportation capacity in and of itself will only begin to deter growth at truly intolerable levels of congestion, if at all. One need only experience traffic congestion and transit overcrowding in Tokyo, Paris, Singapore, Bangkok, Brussels, or London (or Orange County, California) to test this hypothesis. The levels of road and transit service routinely tolerated in these cities would not be accepted in the United States but amply demonstrate that shutting down transportation capacity alone will not stop growth.

It should be noted that tax mechanisms can be used to shape urban form when they are consciously applied as a regulatory tool in conjunction with explicit land use policies. For example, in Japan and some European countries, capital gains and inheritance taxes are set at almost confiscatory levels when land is sold or removed from agricultural use. The net effect is to limit suburbanization and grossly inflate the value of urban land available for development. Urban congestion, crowded offices and apartments, and sky-high rents are frequent by-products. Similar effects could be achieved in the United States if these measures were adopted. However, such drastic tax strategies are unlikely to be supported in the United States, and the life-style changes they would trigger are inconsistent with trends in housing and commercial development since World War II. The use of extreme tax policies to achieve regulatory objectives also is inconsistent with transportation financing requirements, because the primary purpose is to discourage certain changes in land use rather than to generate a predictable revenue stream.

Less drastic transactional measures, such as real estate–related taxes in New York City levied on behalf of the Metropolitan Transportation Authority, are used to support transportation services in the United States. However, they are subject to sudden declines during periods of market retrenchment (*8*) and must be blended into a larger financing package that includes more stable sources of revenue.

Several mechanisms have been incorporated into the land use/growth management process to finance transportation projects. These approaches are briefly examined below.

Impact Fees

The use of impact fees is growing as an infrastructure financing mechanism (*9*), and the amount charged is increasing as well. A *Growth Management Studies Newsletter* (*10*) reported that the national aver-

age for road-related impact fees was more than $1,500 per single family housing unit, more than $1,800 per 1,000 ft^2 of office space, and almost $2,300 per 1,000 ft^2 of retail space. However, impact fees (covering multiple public purposes) of more than $15,000 per housing unit are reported in California, a significant proportion of which is no doubt going toward roads. Fees can influence housing costs and land values; however, outside of a few unusual circumstances involving large-scale community developments under common ownership, they generally are not sufficiently high in relation to selling prices to constitute a major distortion of market forces. If applied in well-developed suburban or urbanized areas, the biased incidence of impact fees on new projects could tend to artificially inflate the value of the existing building stock.

If impact fees were relied on as the basic source of transportation funding, they would quickly reach unsustainable levels—particularly if improvements to regional facilities are considered. The fluctuation of fee revenues with market trends further reduces their attractiveness as a stable source of funding. The literature involving the implications of impact fees on housing costs and neighborhood diversity has not been explored; however, financing transportation improvements through this mechanism may have broader social and economic spinoffs that could feed back into transportation needs. For example, if heavy reliance on transportation impact fees boosts housing prices in a locality, lower-income workers may be forced to live in other areas, increasing commuting needs and offsetting benefits from roads funded by the fees. In many jurisdictions, there are also legal constraints that affect the ability of impact fees to fund major transportation investments. In these cases, impact fees must be used to mitigate transportation demands imposed by the particular development making the payment. In Florida's Broward and Palm Beach counties, the proceeds of impact fee collections are divided among dozens of trust accounts, none of which may have adequate balances to undertake a project. Unless the trust fund balances are expended within a fixed time frame, they must be refunded. The results may be negative influences on land and housing prices, without offsetting benefits in transportation. The spot improvements the fees finance in these cases will neither solve a corridor transportation need nor provide a boost in capacity on a regional facility.

Impact fees, therefore, may best serve as a supplement to other, diverse sources of revenue. This approach is used to support public transit in San Francisco. However, attempting to use impact fees as the principal source of funding for a transportation investment is not

likely to succeed because of market swings and legal constraints. Such a strategy also might face successful legal challenge because of adverse impacts on underlying land values.

Proffers

In high-growth areas that have failed to provide adequate public resources for transportation, the private sector frequently has agreed to the use of proffers as a means to accelerate the entitlement process. Trading specific road or transit improvements for entitlements has become a well-established element of environmental reviews in many jurisdictions. Historically, contributions of rights-of-way for highway improvement are common and are a form of proffer. However, excessive reliance on proffers may yield results that are not totally satisfactory from either a development or transportation perspective. Current market conditions have deeply affected the ability of the private sector to make proffers or, in some cases, to deliver on existing commitments. In one sign of the times, the Resolution Trust Corporation has repudiated letters of credit issued by a number of the savings and loan institutions it has taken over that were posted by developers required to make proffered transportation improvements.

The success of a proffer system depends on the availability of adequate public funding for improvements to fill the gaps between projects and to upgrade regional facilities that must accommodate increased local traffic flows. Proffered transportation improvements are likely to be discontinuous, resulting in lane drops, variable traffic patterns, and isolated segments. Essential projects needed to unclog regional travel may go unfunded, whereas pieces of facilities unlikely to be connected to major routes for years may suddenly appear on farms and woodlands. In Fairfax County, Virginia, the developers of the Fair Oaks project recently completed a costly segment of the Fairfax Parkway, but commuters still await public funding decisions for $300 million worth of construction required to complete the roadway. Similar incongruities have been observed in mass transit, where proffered station improvements may occur at relatively low-priority locations and stand in stark contrast to larger, systemic rehabilitation needs.

Proffers may also be contributing to more dispersed development patterns as developers bargain for and receive entitlements that permit them to leapfrog choke points, contrary zoning boards, competitors, or hold-out property owners.

The ability of private developers to carry the cost of off-site infrastructure improvements is a function of market demand and the basic price of land relative to selling prices. For example, the developers of Fair Oaks have reported that under current market conditions the cost of building their segment of the Fairfax Parkway would not have been economically feasible. Failure to achieve a large enough jump in land value as a result of the completed improvement and development entitlements and the inability to close enough land sales at anticipated prices within projected time frames are the risk factors faced by developers making proffers. Unfortunately, the risks tend to be best managed when public investment in transportation is well below requirements and when the supply of entitlements relative to demand is heavily restricted.

It is a legitimate public policy issue whether a locality has to "shoot itself in the foot" by underinvesting in infrastructure and distorting development economics through the entitlement process before the "cure" of proffers becomes sustainable. Lying at the heart of the dilemma is often the unwillingness of local governments, homeowners, or business interests to accept the unavoidable costs of growth through higher taxes. At the same time, the success of proffers still rests on the public sector's financial capacity to close the gaps between spot improvements that are negotiated. Failure by the public sector to deliver on connecting investments can result in worsening travel conditions, despite the private sector's fulfillment of its proffered obligations.

Special Assessments

Developers in western Fairfax County, Virginia, agreed to pay 80 percent of the $120 million cost to widen Route 28 through creation of a special taxing district. Property owners in downtown Denver pay for the cost of maintaining a transit mall through a special assessment program. In Miami, commercial property owners agreed to pay a special assessment to underwrite the local share of a downtown people-mover system and its subsequent extension. A municipal utility district has been used in Los Colinas, Texas, to finance a people-mover system. An analysis of the use of special assessment districts by Rice Center (*11*) shows an increasing tendency to employ this technique in financing major transportation improvements.

Consensus among landowners is the critical factor in implementing a special assessment program successfully. Recent efforts to construct a fixed guideway system in Denver were derailed by opposition

to a special tax during a period of economic retrenchment. Repeated attempts to impose a special assessment program around stations in support of heavy-rail construction in Los Angeles have been thwarted in the courts.

These observations suggest that in high-growth areas with major assemblages of property or with multiple property owners possessing generally compatible aims, special assessments can work well. Although most often combined with extensive public sector funding, in certain cases sufficient revenue streams can be generated to support a complete investment, rather than a spot improvement. These situations are often perceived by the private sector as opportunities to finance needed infrastructure investments from tax-exempt sources. Long-term financings based on special fees frequently are dependent on guarantees from public entities, which can be difficult to secure. The impacts on land use patterns are likely to be limited because of the relatively low levels of assessment involved.

Special assessments should be differentiated from tax increment financings, such as the transportation improvement district approach adopted in Pennsylvania and being used to fund an interchange near Greater Pittsburgh International Airport. Few localities are willing or able to forgo property tax revenues in order to fund transportation projects. Redevelopment powers are often involved, and the proceeds of tax increment financings are more likely to be used for land assembly, on-site improvements, parking, and amenities than for transportation projects normally viewed as state or federal responsibilities.

Public-Private Partnerships

The Florida High Speed Rail Corporation proposed to build a multi-billion-dollar Swedish-technology, electrified railway from Tampa to Miami using real estate development revenues. Transit projects in New York City, Minneapolis, Honolulu, Houston, and other places have been proposed that involve "super-turnkey" implementation that incorporates the proceeds from land sales, density bonuses, accelerated entitlements, and other real estate development benefits into the bid price for the project. A major rail station and interchange point has been proposed in the New Jersey Meadowlands at Allied Junction that would be privately financed. The author even proposed to build a people-mover system from Three Rivers Stadium in Pittsburgh across the Allegheny River into the Golden Triangle in exchange for more than 1 million ft^2 of development rights. To date,

none of these offers have been realized. The reasons for lack of progress in this area are economic and market-related, as the following examples demonstrate.

The Washington, D.C., transit agency, the Washington Metropolitan Area Transit Authority (WMATA), operates perhaps the finest heavy-rail system in the world and has one of the most successful joint development programs in the United States. It has entered into land leases with developers for air rights and other projects whose collective value is hundreds of millions of dollars. Washington is one of the nation's premiere real estate markets, with downtown land values estimated in excess of $1,500 per ft^2 in various locations. Its rail-served suburbs in Fairfax County, Virginia; Montgomery County, Maryland; and Prince Georges County, Maryland, are among the most desirable development locations in the United States. WMATA's annual budget (bus and rail) is $668 million, and joint development revenues contribute about $5 million per year. The rail system has been operating for more than a decade, and the build-up of joint development revenues has been gradual. In addition, WMATA supports a full-time staff to manage its joint development activities and has invested heavily in consulting services to maximize the value of its land assets.

These numbers are intended to place expectations for the potential role of joint development in perspective. Their purpose is not to discourage joint development as an element of project financing but only to place its revenue-generating potential in context. WMATA has achieved cost savings in constructing and operating its system as a result of public-private cooperation that do not appear in the previous numbers, and its joint development activities have yielded increased ridership, passenger amenities, jobs, more efficient land use patterns, and large property and sales tax gains for the local jurisdictions. However, transportation projects require cash payments to contractors, and the cash flow implications of joint development must be assessed realistically.

New York has invested more than $12 billion in reconstruction of its subway system over the past decade. During this period, an incentive program offering a 20 percent density bonus has been provided by the city in certain Manhattan locations, and developers have had to make extensive transit improvements as part of the city's environmental review process. With some of the highest property values and most arduous land use review processes in the United States, New York's program has generated about $120 million in privately funded station improvements. One urban redevelopment project

now working its way through the last of 55 lawsuits is anticipated to yield more than $50 million in improvements to the Times Square subway complex. The success of New York's joint development program has been a function of the availability of state, city, and federal funds to acquire the rail cars and make track, shop, yard, and other improvements that have permitted a systemwide upgrading to occur. Reliance on certain real estate revenues also has slowed the program, as the continued failure to close the anticipated sale of the Coliseum property (originally because of successful legal challenges and now because of market conditions) has opened a hole in the capital budget of several hundred million dollars.

As Florida's High Speed Rail Program has experienced, the real estate market fluctuates, and few developers or landowners can make firm commitments into the future. The timing of joint development cash flows rarely coincides with the cash requirements of transportation construction projects. The magnitude of dollars that development projects can contribute toward transportation projects is constrained by market economics. Even massive sales of density by public agencies can be thwarted by market trends and the inability to economically justify building out all of the square footage a bonus program may yield. For example, the original economics of the author's proposed Three Rivers Stadium project in Pittsburgh called for construction of three towers of 500,000 ft^2 each. Analysis of subsequent market activity suggested that such large towers could not be leased quickly enough to be economically feasible, and that buildings half the size might be more appropriate. The reduced density limited the potential value that could be tapped to help pay for an associated people-mover system.

Tying transportation investments to land development projects can result in compounding risks and the distinct possibility that a needed transportation project will be placed on hold because of considerations totally removed from underlying travel requirements. On the other hand, transportation investments whose justification is based on future growth projections, such as the Hudson River Waterfront Transitway in New Jersey, are appropriately linked to realizing development build-out milestones.

Proposals for innovative procurement methods that incorporate public-private partnerships, such as super-turnkey and build-operate-transfer, may have the potential to reduce project costs through improved construction management and planning, as well as through accelerated implementation. However, in order to attract private

"equity," development-related risks must be recognized, and public sector guarantees will be required in most cases in order to underwrite the long-term revenue risks involved.

Private toll road proposals also may be considered in this category. In many cases, the proposals are growth-driven and arise from a shortfall in public funding. Corridors in Northern Virginia and Orange County, California, are likely to experience strong use at relatively high toll rates because of capacity constraints on free roadways. Land donations are an important economic feasibility factor. A substantial portion of the financing package supporting the projects being built by the Transportation Corridor Agencies near Irvine, California, is being derived from impact fees and assessments. Value created by the highways will be used to help pay their costs; however, the inability of public agencies to provide adequate transportation capacity is the underlying basis for a private sector approach. It remains to be determined if the higher cost of capital for these projects will be offset by private sector construction and operating efficiencies. The administration's proposal to underwrite preliminary engineering costs and permit up to 35 percent of the cost of toll road construction to be federally funded could go far in reducing the risk premiums that investors in private infrastructure projects will require.

In summary, mechanisms to achieve public-private partnerships are a fruitful and important element of an overall strategy to finance transportation investments. However, their ability to substitute for an adequate level of public financing is not unlimited, and much of the value being shared is the result of market distortions caused by inadequate public investment.

FUTURE RESEARCH DIRECTIONS: CAPITAL BUDGETING AND CONSUMER PREFERENCES

There are important opportunities to attract private sector investment to transportation projects, and there is also a need to allocate available capital among projects properly. In assessing current transportation finance issues and their relationship to land use, it appears that more attention has been given to different mechanisms for raising funds than to how available funds are spent. It is the spending side of the equation where the interactions with land use may be more significant, and where the potential for a real leap in productivity and efficiency may be possible. There are also important opportunities to

devise and deploy technologies that can yield services that support consumer preferences for dispersed development patterns.

With greater emphasis now being placed on intermodalism, private sector involvement, environmental sensitivity, regional planning, and the upgrading of technological solutions to transportation needs, greater attention to the capital budgeting process and new types of transport services could not be more timely.

For too long, federal funds have been viewed as "free money" by agencies fortunate enough to secure congressional earmarks or when operating and maintenance dollars are limited but capital funds from grants or bonds are readily available. The perverse incentives built in to the categorical nature of transit and highway projects in terms of matching shares, eligible uses of funds, and other factors cannot be overlooked and it is proposed that they be altered in forthcoming reauthorization of surface transportation programs. Tax and debt limitations imposed on state and local governments can induce financing structures that lack justification in economic terms. Finally, difficulties in properly recognizing capital consumption have led to enormous, unfunded depreciation liabilities coinciding with needs for capacity expansion and new services.

These considerations point to a requirement for more sophisticated and rigorous capital budgeting processes, if the benefits of available public and private dollars for transportation investment are to be realized. The most positive influence on land use would be to allocate capital among transportation projects so as to minimize the opportunity costs of paying for public and private investments that fail to respond adequately to real, systemic priorities. Recent proposals to establish congestion, bridge, and pavement management systems, as well as to coordinate transportation and air quality planning, are important elements of this process. In addition, suggested requirements for equitable allocation of funds within states are also essential for maximizing the benefits of transportation investments. The earlier findings regarding the limited benefits and potential costs arising from future expansion of the rural highway system need to be translated into a meaningful analytical framework that can restrain the historic tendencies of many state legislatures and departments of transportation in their allocation decisions.

Parallel to this effort must be a reevaluation of how needs are assessed and quantified. If transportation needs are being caused by an undisciplined land use planning process, how can this condition be evaluated fairly and acted on in federal, state, and local allocation processes?

Technological advancements in maintenance systems do not seem to exert influence on either the manning requirements or the numbers of costly bus and rail shops. Overbuilt road solutions designed for 20-year planning horizons must be balanced against immediate congestion problems in cities and suburbs. Preservation of underused bus routes and rail facilities exaggerates operating expenses and capital needs estimates when rehabilitation costs must be incurred. Determining highway needs based on unmitigated single-occupant automobile travel demand projections or transit needs based on the requirements of the highest-cost alternative will not lead to efficient allocation decisions. Indeed, planning tools that can create integrated transportation solutions (rather than highway or transit) will be required if the promise of flexibility in proposed legislation is to be fulfilled. The result of these efforts must be to minimize the large opportunity costs being borne regionally, and ultimately nationally, by permitting distorted perceptions of needs to drive investment decisions.

Capital budgeting systems employed at the Southern Pennylvania Transportation Authority in Philadelphia and the Metropolitan Transportation Commission in Oakland, California, have attempted to come to grips with these issues; however, more research to support objective project selection is required.

Achieving a better understanding of a cost of capital can be an important element in making appropriate allocation and financing decisions. For example, in many instances, priority is being given to projects with high levels of private sector participation. The long-term cost of these contributions may be substantially higher than comparable levels of public funding when the rates of return on invested capital are compared. However, the willingness of private investors to commit funds may be a useful indicator of a project with strong near-term benefits.

Private sector equity may require a 20 percent return on investment compared with an 8 percent municipal bond or a 7 percent Treasury bond. Determining which projects would be best funded from which sources and what the optimum mix of public and private resources should be for a given undertaking is necessary if the true costs of a project are to be understood and efficient allocation of capital is to be achieved. Similarly, providing for future capital replacement needs by recognizing depreciation in some manner could help decision makers select among projects, as well as make rational decisions regarding the scope of individual investments.

With proper planning and financial analysis tools in place, the following essential issues can be addressed:

- Can intermodal assessments be made to devise an optimum solution to a transportation need without regard to categorical funding biases?
- Can incentives be created to accept lower-cost alternatives?
- Can gains-sharing strategies be devised that permit underused services and facilities to be rationalized?

Research is also needed on techniques to minimize the human impacts of increased efficiencies arising from the introduction of new technology or more rigorous project selection criteria. Job displacement is a serious issue in retarding the introduction of new technologies and rationalizing existing services. For example, coordinated use of advanced computerized dispatching and vehicle locator and automatic fare collection systems could trigger significant changes in the delivery of transit services. Fixed route service built around 40-ft buses might be made obsolete in many areas.

New types of services employing information-based technologies noted previously could offer feasible alternatives to single-occupant automobile travel in areas of dispersed development at delivery costs much lower than those of conventional public transit. At the same time, the impacts on existing institutions and labor might be substantial and act to deter aggressive experimentation. It is essential that the paths to implementing new "soft" technologies with potential for cost savings and better service in popularly desired development patterns not be ignored in research initiatives that are purely hardware oriented.

Finally, it is important that technological research recognize the market reality that consumers prefer cars and living in single-family homes on large lots and recognize the land use implications that follow. Transportation finance could be greatly facilitated if taxpayers and consumers were offered a choice of products and services that enabled them to satisfy their life-style preferences.

CONCLUSION

In summary, the impacts of financing mechanisms on urban form are limited, compared with market and regulatory influences. The implications for land use tend to arise in a negative sense from inadequate

public funding for transportation improvements. The greater the development pressures and the shortfall in improvements funded from broadly based revenue sources, the more significant will be the impacts of specific transportation mechanisms on urban form. Public-private partnerships have an important role to play in transportation finance; however, their significance as a funding source has been oversold in many cases and frequently arises as a solution only after the public sector has failed to perform. Adequate public dollars are almost always needed to connect spot improvements that may be financed through fees, proffers, and assessments.

Future research should be targeted at improving the ability to allocate limited capital resources rationally in a highly politicized environment, increasing the legitimacy of needs assessments at the project and regional level, removing institutional barriers to deriving the benefits from new technologies, and targeting technology development toward products and services that respond to actual lifestyle preferences.

REFERENCES

1. G. Giuliano. *Report 1—Literature Synthesis: Transportation and Urban Form.* School of Urban and Regional Planning, University of Southern California; FHWA, U.S. Department of Transportation, October 1989.
2. D. J. Forkenbrock, T. F. Pogue, N. S. J. Foster, and D. J. Finnegan. *Road Investment to Foster Local Economic Development 1.* University of Iowa Public Policy Center and Midwest Transportation Center, Iowa City, Iowa, May 1990.
3. J. R. Kenworthy and P. W. G. Newman. *Learning from the Best and the Worst: Transportation and Land Use Lessons from 32 International Cities with Implications for Gasoline Use and Emissions.* School of Environmental and Life Sciences, Murdoch University, Perth, Western Australia, October 1987.
4. C. B. Leinberger. Development Trends and Real Estate Opportunities in the 1990's. *Urban Land,* December 1990, p. 4.
5. W. Kulash, J. Anglin, and D. Marks. *Traditional Neighborhood Development—Will the Traffic Work?* ASCE, New York, N.Y., March 1990.
6. *Fact Sheets for Reauthorization Proposal for Surface Transportation.* FHWA, U.S. Department of Transportation, February 1991.
7. *Transit Fact Book.* American Public Transit Association, Washington, D.C., 1989, p. 24.
8. Transit Deficit has Tripled in 7 Weeks. *The New York Times.* February 21, 1990, p. B1.
9. *Zoning News,* American Planning Association, Chicago, Ill., December 1990, quoted in *Land Use Digest,* Urban Land Institute, Washington, D.C., January 1991, p. 2.
10. *Growth Management Studies Newsletter,* University of Florida, June 1990, in *Land Use Digest,* Urban Land Institute, Washington, D.C., January 1991, p. 2.
11. *Special Assessment Financing for Transit Improvements.* Joint Center for Urban Mobility Research, Rice Center; UMTA, U.S. Department of Transportation, July 1987.