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Author

Cervero, Robert

Publication Date

1987-08-01

Peer reviewed

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Robert Cervero
Department of City and Regional Planning

Working Paper No. 470

August 1987

Institute of Urban and Regional Development
University of California, Berkeley

TRANSPORTATION AND URBAN DEVELOPMENT:
PERSPECTIVES FOR THE NINETIES

Abstract

This is a review of recent developments in transportation and land use planning in the United States. The use of transportation investments as levers for joint land developments and urban economic expansion has emerged as a dominant focus in the field. Virtually all recent U.S. rail transit projects are attempting to exploit joint development opportunities, both in terms of value-sharing and cost-sharing. Another common aim of many fixed guideway investments is to reinforce multi-nodal regional development by linking together planned mixed-use outlying subcenters.

In contrast, new growth in many burgeoning non-rail cities throughout the country is increasingly focusing on highway-oriented, suburban office parks and urban villages. The mobility challenges posed by the dispersal of regional employment and residential growth are enormous. Promising approaches to traffic mitigation in these settings include clustered side development, job-housing integration, and private financing of infrastructural improvements.

Still, a number of legal, institutional, and logistical barriers continue to impede progress towards transportation and land use coordination in all of these emerging areas. As powerful demographic and economic forces continue to change travel preferences in the U.S. and suburban growth trends continue, high priority must be given to nurturing a more visionary and strategic transportation and land use planning effort.

TRANSPORTATION AND URBAN DEVELOPMENT:
PERSPECTIVES FOR THE NINETIES

INTRODUCTION

History has shown time and again that transportation and land use decisions profoundly affect one another, and that failure to plan accordingly can severely undermine the quality of urban living. Indeed, many urbanologists preach that problems of arterial gridlock, smog, and shapeless city growth are a direct result of our past inabilities to fully appreciate this intrinsic, often delicate, relationship. Most, if not all, leading transportation problems today find their roots in how we choose to organize urban space -- where we locate offices, factories, housing, and shops. In places like Los Angeles, Houston, and Atlanta, where 1 1/2 hour one-way commutes are not uncommon, congestion and pollution woes can be largely attributed to what planners call "job-housing imbalances". Such problems are less a reflection of insufficient freeway and transit capacity than a mismatch of where people live and work -- i.e., they're fundamentally systemic problems, and speak directly to the intimacy of transportation and land use relationships.

Interest in strategic transportation and land use planning seems to have waned in recent years under the weight of strained finances and centralized policy directives that mandate action-oriented, management-based transport programs (Jones and Sullivan, 1982). Metropolitan Planning Organizations (MPOs) still carry out at least the rudiments of the classical 3C's transportation planning process and a plethora of joint public-

private projects are proceeding around several recently-constructed rail transit stations. However, the fervor which surrounded the successes of Toronto's and Montreal's rapid rail transit systems in the sixties and early seventies as truly powerful city-shapers seems to have subsided to a whimper. The widely-publicized failure of BART to emulate earlier successes, coupled with today's more fiscally-conservative political agendas, are not solely responsible for this retreat, however. There seems to be a more pervasive ideological shift under way, rather, that calls for more marginal, small-scale changes to our transportation systems, more off-loading of responsibilities to the private sector, and more reliance on natural market forces.

This drift from the original precepts of integrated transport-land use planning could portend a difficult future for the profession. The emerging metropolis transportation planners will find themselves working in promises to be quite different. Notably, a host of widely-publicized "mega-trends" will profoundly alter today's urban landscape and the travel that takes place on it; amongst these are rapid increases in the proportion of working women and two-wage earner families, the steady transformation to a post-industrial, service-based economy, and the recent explosive growth in suburban and exurban employment centers, such as office and business parks (Fisher, 1984; Cassells, 1984; Spielberg and Andrie, 1982). The time seems ripe for a rebirth of interest in transportation-land use planning, one that will hopefully not only spur healthy regional growth but also restore the earlier enthusiasm for the field.

This article explores promising future directions for integrating transportation and urban development planning. Emphasis is placed on scanning the literature to probe what we currently know, where the field appears to be heading, and what gaps remain. An effort is also made to showcase what are considered to be exemplary programs involving transportation and land use coordination.

PAST EVIDENCE ON TRANSPORTATION AND DEVELOPMENT

Transportation has historically shown its prowess at shaping the scale, density, and economic makeup of cities. Streetcars built at the turn of the century were largely responsible for transforming high density walking cities with radiuses of 2-5 miles to more star-shaped forms with residents living as far as fifteen miles from downtown (Schaeffer and Sclar, 1975; Warner, 1962; Wachs, 1984). During the first half of this century, apartments, shops, offices, and small factories often clustered around streetcar, subway, and commuter rail stations, creating viable nodes of city life. One of the earliest accounts of this was Spengler's (1930) revelation that real estate values rose over 500% around several Brooklyn subway stations following the introduction of rail services. The author was also quick to note, however, that where neighborhoods were already in a state of disrepair, they continued to decline regardless of transit's presence.

It is difficult to overstate the lasting imprint most of these early transportation investments had on American cities. Indeed, because the increments of new accessibility provided by

early rail lines were so enormous, the spines and structures of most older American cities were contoured more by rail transit than any other transportation technology -- past, present, or future. As Homer Hoyt (1933) observed, "the location, shape, and size of our cities has been a function of the form of transportation prevailing during a city's main period of growth", which in the U.S. was largely the turn-of-the-century streetcar lines.

The ascendancy of the automobile and motor bus, particularly following WWII, witnessed the rapid "filling in" of many radial rail corridors, combined with the outward expansion of urban perimeters. As car ownership became widespread, corridor development gave way to urban sprawl (Garrison, 1981; Smith, 1984). Although the distinction between city and country quickly blurred with the onslaught of the automobile, most American cities still retained their overall radial-concentric forms, including pre-eminent downtown cores.

The first half of this century gave rise not only to the most dramatic incidences of transportation-land use interactions, but also to the development of formalized theoretical models. Theories on location and site rent originally developed for rural settings (Von Thunen, 1966; Christaller, 1966) were grafted onto the more contemporary urban scene (Haig, 1927; Alonso, 1964), with transportation playing a pivotal role in accounting for land use changes, defining population and employment densities, and mediating land values. A bevy of simulation models which operationalized these theories soon followed, most of which have built upon the foundation's of Lowry's (1964) gravity-based

regional model of Pittsburgh's economy.

Perhaps the most rigorous empirical inquiries into the transportation-land use connection have occurred over the last twenty years following the introduction of new-generation rail transit systems. A rapid succession of impact reports followed most of these projects. To date, the land use effects of heavy rail transit in Toronto, Montreal, San Francisco, Washington, and Atlanta have been mixed, with outcomes dependent on the presence of numerous complementary and reinforcing factors (Boyce, 1980; Knight, 1980; Dyett, et al., 1979; Donnelly, 1982). Important prerequisites are a healthy and growing regional economy, an expanding market for office, retail, and housing development, ease of land assembly, a hospitable station area environment, unwaivering political support, and the existence of pro-development zoning, taxation, and land use policies. Where such conditions exist, rail transit has been found to exert major land use influences; conversely, where they are absent or weak, few meaningful impacts have been recorded.

Toronto's successes with rail transit have been widely heralded. Aerial photographs taken before and after the construction of Toronto's Yonge Street line provide visible evidence of the abilities of rail stations to attract high-rise growth. During the early sixties, an estimated 90% of all office construction was within a five minute walk of subway stations (Heenan, 1968; Kearns, 1964). Unlike other North American projects, moreover, Toronto's subway stations also became magnets for high-rise apartment construction. By attracting residential growth, a settlement

pattern has evolved whereby many residents both live and work near stations, thus inviting transit usage. In contrast, few American cities have high-rise residential development around transit stations, forcing them to either drive to work or go through the hassle of driving to stations, parking, and then transferring to rail. More often than not, once Americans get into their automobiles, they stay in them until their final destination.

A number of fortuitous circumstances accompanied the construction of rail transit in Toronto between the early-50's and late-70's, many of which will be difficult to duplicate, including: rapid economic growth sustained by immigration; a strong tradition of streetcar patronage; supplemental expropriation of land around stations; ambitious programs of bonus zoning and air-rights leasing; and an efficient underground pedestrian network linking stations. Additionally, the fact that Canada's federal government has opted not to build a nationwide interstate highway network, coupled with the fact that Canadians cannot deduct mortgage interest payments from their income taxes and thus have less incentive to buy single-family homes in the suburbs, have worked in favor of transit as well.

San Francisco's BART system represents the other end of the land use impact spectrum. BART's effects on residential development and property values have been fairly inconsequential, while its impacts on new office construction have been largely limited to a strip of downtown San Francisco where incentive zoning, redevelopment financing, and civic improvements were put into

place (Webber, 1976; Dyett, et al., 1979). Zoning moratoriums around established residential neighborhoods, the placement of lines in freeway medians and along freight corridors, and the already built-out structure of much of the Bay Area undoubtedly suppressed BART's station area impacts. Some BART enthusiasts have more recently denounced these negative appraisals as being premature, noting that after a decade of operations a number of outlying BART stations are beginning to attract mid-rise office, housing, and retail investments (Fitzpatrick, 1983; Markowitz, 1985). Indeed, modern-day heavy rail systems seem to be longer term investment propositions whose land use benefits may only become fully evident after several decades of operations.

More recent experiences with rail transit in the U.S. have been slightly more encouraging. In particular, Metrorail in Washington, D.C. and MARTA in Atlanta have helped spawn new downtown office and retail investments in addition to conferring handsome windfalls to owners of property around a number of inner-city station areas (Donnelly, 1982; Simons, 1981; Straus, 1984; Burke, 1984). Since Metrorail's opening in the mid-seventies, for example, roughly half of the Washington region's growth has occurred in the immediate vicinity of subway stops, even though these zones comprise less than 10 percent of metropolitan land area (WMATA, 1983). By and large, however, neither MARTA or Metrorail have stimulated much residential construction around stations, primarily because surrounding land values have become too expensive for anything other than commercial and office uses (Straus, 1984).

What lessons have past experiences with rail transit projects and other transport investments taught us regarding development impacts? For one, the land use effects of any one transport project, be it a heavy rail system or freeway, are apt to be far less than in years past because of the high degree of accessibility most urban residents already enjoy. Contemporary cities are ubiquitous, thus the incremental effects of any project on the spatial organization of urban activities will generally be modest. Related to this is the fact that many North American metropolises proposing new rail systems are already substantially built-out and at the mature stages of their regional growth curves, leaving few development-inducing opportunities for new transport projects. Moreover, experience has taught us that rail transit investments really cannot create new urban growth, but rather can only play a marginal role in guiding where already-committed development occurs. And these development-guiding abilities of transit can only be realized when supportive, sometimes exogenous, factors exist, such as a robust regional economy, escalating fuel prices, and permissive zoning.

Given these past lessons, what are some of the more likely futures for transportation-land use planning and practice? Four emerging areas are discussed next: joint development opportunities, primarily around new rail stations; transportation as a lever for regional economic development; fixed-guideway investments as catalysts for sub-center integration; and the preservation of mobility around suburban downtowns and outlying employment centers. It is argued that these areas offer fertile ground for renewing our

professional commitment to transportation and land use planning, and provide plentiful opportunities for future conceptual advances as well as creative practice in the field.

JOINT DEVELOPMENT AND TRANSPORTATION

Joint development of transportation facilities and real estate investments has gained increasing popularity in recent years and will likely gain momentum in the nineties and beyond. In the transit field, where it has been most aggressively pursued, joint development has meant investing in new projects as a means of leveraging private real estate development -- i.e., enticing office tower construction in the air rights of a subway station or connecting a retail mall entrance to a transit terminal. The central idea is to create a viable station node, benefitting the transit agency by increasing traffic volumes, property tax yields, and leasing revenues and helping business by delivering customers to their front doors and providing potentially handsome profits from capitalized accessibility gains.

Most joint development projects are triggered by a mutual interest in "value-sharing" -- i.e., public-private sharing of the increases in land values induced by transit improvements. "Cost-sharing" can be equally important, however. Through an assortment of mechanisms, such as benefit assessment financing, land and air rights leasing, and connection fees, transit authorities can effectively spread the cost burden of new rail facilities to adjoining land developers, many of whom are eager to link their projects into new rail stations.

Contrary to popular opinion, neither Toronto or Montreal pursued any joint development programs in the sixties or seventies simply because intense growth pressures already existed around stations, obviating any need. Joint development has, however, been an intimate part of more recent rail projects in Washington, Miami, Buffalo, and Vancouver. Washington's Metropolitan Area Transit Authority (WMATA, 1983) recently estimated that joint development projects slated for the Bethesda and New Carrelllton stations will generate benefits that exceed public sector costs by over \$200 million over the next fifty years. Six projects to date have already produced a guaranteed annual revenue yield of \$2 million for WMATA, along with an estimated 2.5 million new rail and bus patrons (Keefer, 1984). In addition, WMATA has staged the construction of stations with the building of several joint development projects to reduce costs (Sedway Cooke Associates, 1984). For example, Washington's Farragut West Metro Station taps into the International Square office and retail project's heating and air condition system, while at the outlying Bethesda Station heat generated by the transit system will be harnessed and recycled into an integrated mixed-use project. Developer-financed bus bays and kiss-and-ride spaces at the Van Ness and Bethesda stations, moreover, are expected to save WMATA \$1.5 million in construction costs.

Joint development has also been a vital part of urban renewal campaigns linked to both Baltimore's and Miami's recent heavy rail investments. Baltimore's Market Center redevelopment project, for instance, adjoins the entrance plaza of the

Lexington Market Metro Station (Public Technology Incorporate, 1983). One million square feet of office, 350,000 square feet of retail space, and a parking garage will be linked to the station through an internal network of pedestrian ways. In Miami, the Overtown Transit Redevelopment Area project is revitalizing a four block declining inner city neighborhood through new high-density, mixed-use investments tied to the downtown rail station.

Transit authorities in San Francisco, Philadelphia, Boston, Atlanta and several other cities where rapid transit already exist are also inaugurating air rights leasing programs (Keefer, 1984). In several cases, such joint development efforts have been on-going for many years, yet the transit authority has enjoyed no direct value-sharing returns because projects were sponsored by other benefitting public agencies, such as redevelopment authorities. Recently, for example, both Oakland and San Francisco successfully leveraged new joint developments around selected BART stations by directing public infrastructural improvements and zoning incentives in these areas (Sedway and Cooke, 1984). This is in contrast to the scattered and functionally disaggregated developments that have sprung up around several other BART station areas.

A number of Canadian cities have also spearheaded rail transit joint development projects. Recent rail projects in both Edmonton and Vancouver, for instance, have sought to exploit joint development and cost-sharing opportunities. More than one-half of the expense of extending Edmonton's northeast light rail transit line in 1981 was financed by a special fee negotiated between the city and two developers of the Clareview subdivision

(Cervero, 1984a). The developers paid the city \$1,700 per net acre of land and donated twelve acres of right-of-way in support of the LRT project, receiving free air rights for developing above the station in return. And in Vancouver, where a new 13 mile advanced light rail line is slated to begin operation in 1986, several cost-sharing deals have been struck between the regional transit authority and station area landowners. Around one downtown station, for example, the largest retail store in Vancouver gave away subterranean rights and over 5,000 square feet in retail space for the construction of an underground pedway. In addition, the store has agreed to pay the regional transit authority a set amount annually (based on its total building floorspace) for retail frontage onto the pedway concourse. Canadian cities building new rail systems have been more entrepreneurial in pursuing joint development interface than their American counterparts owing to the existence of more permissive enabling legislation (Soberman, 1983).

Los Angeles has perhaps the most ambitious joint development plans for a yet-to-be-built urban rail system. There, local planners are pursuing an aggressive package of tax increment and special benefit assessment financing to offset up to 25% of the proposed 18.5 mile subway line connecting downtown Los Angeles with the San Fernando Valley (O'Carroll and Spivak, 1984). State legislation has empowered the regional transit district and redevelopment authority to acquire supplemental properties around station sites, form assessment districts, and implement performance zoning. Around several areas, the provision of

direct pedestrian access to rail, additional parking, and off-street bus terminals will enable floor area ratio bonuses of up to 13:1 (SCRTD, 1983). Some critics have openly questioned whether a multi-billion dollar rail project can be justified in an auto-dominated setting such as Los Angeles. Although the near-term regional land use effects of the system are apt to be marginal and the entire project could be scuttled due to impending federal budget cuts, Los Angeles has nonetheless taken joint development seriously, to the point where interim controls have been implemented to prevent any preemption of value-sharing possibilities by premature private development.

Important precedents exist for joint development planning around other types of urban transportation facilities as well. Notably, new downtown multi-complex developments have been coordinated with renovated commuter railroad stations in Philadelphia, Newark, Providence, and several other eastern seaboard cities (Lutin and Bergan, 1983; Byrne and Baker, 1981). In downtown Philadelphia, the Gallery II project has helped revitalize a distressed commercial strip by integrating over 300,000 square feet of new retail space and two office structures into a new commuter rail station. Newark's Gateway urban renewal project, moreover, will link the renovated Penn Station with several high-rise office towers, an enclosed retail arcade, and parking garage via a glass-enclosed pedestrian skywalk.

Denver's Regional Transit District (RTD) has pioneered joint development applications to all-bus systems. RTD has leased the airrights above the Civic Center terminal at the southern end of the 14-block transitway mall to a private developer who is

building a commercial office tower (Keefer, 1984). The lease agreement guarantees the RTD an estimated \$55 million in revenue over 15 years and eventual ownership of the building. In addition, air rights above a new downtown bus terminal in Santa Ana, California has been leased to a developer of a new downtown office building (Public Technology, 1983). The new Transportation Center project, which also includes a four-storey parking garage connected via an elevated walkway to the airrights structure, is the centerpiece of Santa Ana's \$10 million downtown revitalization effort.

Joint development has not only been limited to the transit sector. Boston has pioneered the use of highway air rights leasing to regain valuable inner-city land (Hollister and Lee, 1979; Jolliffe, 1984). The eight-storey John Hancock parking garage and the recently-completed \$500-million Copley Place mixed-use development have been constructed over portions of the Massachusetts Turnpike. Although building above the roadway increased the cost of the Copley Place project by as much as \$10 per square foot, the benefits of an expanded tax and employment base in the central city were felt to justify the added expenses.

The future of joint development in the transportation field certainly hinges on more than our abilities to duplicate these past success stories. Foremost is the need to develop responsive institutional structures and incentive programs to sustain and promote these ventures. Most attempts at integrating transit and land use over the past twenty years have often proceeded in a atomistic, ad hoc fashion. In contrast, Washington and Los

Angeles offer useful examples coordinated institutional responses. In both places, transit authorities, redevelopment agencies, planning and engineering departments, private businesses, and neighborhood groups have worked toward developing comprehensive land use plans prior to any construction. These efforts have enabled local agencies to put compatible zoning and other necessary regulatory adjustments into place, giving private developers ample time to assemble prospective sites and secure necessary funding. Cities like Baltimore have also gotten into the "project packaging" business by establishing development corporations which not only work closely with private interests in securing the necessary funding, leasing, and zoning support, but also seek to discourage any premature land speculation and block-busting activities.

The proverbial "bottomline" of any successful joint venture is that there must be mutual sharing of gain and pain. Programs that do not strike an equitable balance in the distribution of rewards and costs are doom for failure. Value recapture programs, such as benefit assessment and required exactions, can backfire if developers perceive that their potential profit margins are squeezed too low. Politicians may also be reluctant to grant transportation authorities development powers for purely ideological reasons -- e.g., real estate matters are outside the public sphere. Projects can also become easily embroiled in public controversy, particularly if scarce government dollars have to be front-ended or citizens fear their residential neighborhood will be impinged. Defining what types of joint development actions are within the public purview and balancing

the distribution of benefits and costs among all parties remain imposing challenges. Developing fair-share cost allocation methodologies will doubtlessly be a major research challenge for the 1990s.

TRANSPORTATION AND ECONOMIC DEVELOPMENT

A related area that holds promise for rejuvenating comprehensive transportation planning is economic development. Considerable interest has focussed on using transportation investments not merely to stimulate physical station area growth, but also as a lever to strengthen the economy of regions by expanding employment and attracting new capital. Whereas joint development tends to be more site-specific in focus, economic development involves a far more macro perspective, engendering not only physical land use planning, but the expansion of regional employment and production as well. Economic development has gained most attention in depressed areas where transportation investments offer hope for inducing structural shifts from older declining industrial activities to new growth-oriented sectors of the economy. As with joint development, deal-making with private investors, in addition to supportive regulatory and tax policies, are essential if a conducive environment for sustained economic growth is to be attained.

While joint development projects offer the most common examples of transportation/economic linkages, other creative approaches are also being pursued. The British Columbia and Ontario provincial governments in Canada, for example, are jointly building intermediate capacity transit systems (ICTS)

involving linear induction technologies, driverless train control, and steerable axle systems largely on economic development grounds. Both Vancouver's 13-mile radial system and Toronto's 7-mile rail extension to the Scarborough Town Centre involve these technologies. Besides structuring urban growth (see next section), these projects aim to showcase prototype technologies with the ultimate aim of exporting them to other places. Vancouver estimates that constructing the ICTS project will produce 5,500 manyears of regional employment, including the largest off-site manufacturing contract ever awarded for precast concrete beams (BC Transit, 1984). It is important to note, however, that unless such projects can successfully export their technologies to other political jurisdictions, any regional income gains are purely redistributive, taking tax dollars away from potential social and public works projects in other regions.

Improved access to declining and economically distressed areas can also have substantial economic development payoffs. In Portland, Oregon, for example, transportation and economic development specialists have inaugurated a municipal vanpool program to help bolster an underutilized, inner-city industrial area, freeing up land that would otherwise be used for parking for more productive purposes (Richards and Krasner, 1981). Metropolitan wide vanpooling and ridesharing programs are publicly supported in many urban areas partly in recognition of the need to reduce traffic congestion in order to attract and retain growth industries. Moreover, many rail proposals today are being initiated using economic development rationales, in hopes

that modern rapid transit will give regions a competitive edge over others in luring new businesses.

Transportation investments are also being targetted along specific corridors that offer potential economic payoffs. The Port Authority of New York and New Jersey, for example, has embarked on a massive program of improving regional airport access largely on the grounds that tourism, entertainment, and international business activities are expanding industries with many trip ends focussed on the Newark, La Guardia, and Kennedy terminals (NCUED, 1982). In addition, transportation projects have become the centerpieces of revitalization efforts in special enterprise zones. In Chester, Pennsylvania, for example, major capital roadway improvements are part of a comprehensive enterprise zone package (including tax relief, bank loans, and relaxed zoning) to improve access to a mixed-use waterfront area that has suffered from the isolating effects of an interstate highway corridor and freight tracks (Roggenburk and Mufti, 1985).

Many obstacles still stand in the way of linking transportation with regional economic development, however. Both fields are encumbered by institutional fragmentation with many overlapping levels of bureacracy as well as a general absence of comprehensive, long range planning (Richards and Krasner, 1981). Divergent views on what role transportation should play in regional economics also hamper progress. Still, transportation investments which complement powerful on-going regional economic shifts, whether they be towards service industries or high technology enterprises, will be essential prerequisites of any thriving, expanding economy. And a strong economic posture, in

turn, surely must exist before any future transportation investments can demonstrate their city-shaping prowess. Economic development, urban land clustering, and transportation investments unquestionably work the best when they go hand in hand. The Urban Mass Transportation Administration (UMTA), in fact, created an Office of Private Sector Initiatives in 1984 in recognition of this very proposition.

TRANSPORTATION AND THE INTEGRATION OF SUB-CENTERS

Another emerging and important trend in the transportation and development field has been the use of rail transit and other major capital investments to support a system of new, often mixed-use, satellite growth centers. A number of metropolitan areas, including Atlanta, Toronto, San Francisco, and Vancouver, are pursuing multi-nodal development strategies whereby new growth is being targetted at mixed-use, pedestrian-oriented subcenters. In most of these cases, rail transit is being called upon to interconnect and promote these satellite developments.

Stockholm's use of rail transit since the early fifties to support a ring of over twenty satellite mixed-use centers is perhaps the most graphic, widely-publicized example of this (Holmgren, 1966; Goldsack, 1982). A typical Stockholm subcenter consists of a shopping mall built around a subway station and surrounded by a mix of garden-style and mid-rise residential complexes. Most satellites have populations of 25,000 to 50,000 and are interspersed at regular intervals along radial lines, somewhat like pearls on a string. More recently, a number of Canadian cities have emulated Stockholm's model, employing urban

rail improvements to interconnect "Town Centres". The Canadian tradition has been to designate these multi-function sites well in advance, assembling and protecting the necessary right-of-way over time and making incremental planning decisions that direct employment and residential growth to these satellite nodes. Most notably, the Toronto metropolitan area has recently embarked upon a hierarchical multi-nodal development program, its with new rail extensions playing a prominent implementation role in the scheme (Pill, 1983). Metro Toronto has designated Scarborough and North York (each roughly 12 miles from the regional CBD) as new mini-downtowns, with each secondary center slated for 40,000 employees and 15,000 residents at build-out. Toronto's metropolitan government has sought to channel jobs that would have otherwise spilled over onto highway-oriented office and commercial strips into these two catchment centers. Combined with an extensive network of elevated pedestrian skybridges and strict controls on parking, advanced light rail transit is being called upon to help mold new, viable work centers that operate on more of a human scale than would be permitted by highway-oriented development.

Many light rail transit programs in the U.S. also hope to promote multi-centered growth. Over twenty American cities are either seriously considering or have actually broken ground on new LRT systems, and in roughly half of these cases, formal planning efforts are underway to promote subcentering (Cervero, 1984a). Several factors, however, could suppress LRT's clustering abilities. For one, the lion's share of LRT corridors are aligned along railroad corridors, most of which can be

characterized as unattractive industrial and freight belts. Moreover, the at-grade and elevated alignments of most LRT projects will likely make air-rights development either impractical or prohibitively expensive. Along Portland's Banfield line, for instance, it has been estimated that the cost of building any above-station air-rights structures would exceed \$40 per square foot (Arrington, 1985). As with heavy rail transit projects, moreover, LRT investments will require development incentives and other inducements before substantial station area clustering occurs.

TRANSPORTATION AND SUBURBAN GROWTH CENTERS

While fixed-guideway transit offers hope for concentrating development around satellite centers, most suburban employment growth in the U.S. has nonetheless focussed on lower-density, campus style office and business parks. Particularly in western and sunbelt areas like Houston, Denver, and Orange County, small and Fortune 500 businesses alike are relocating many of their employees in sprawling office parks where amenities are high and land costs comparatively low (Cervero, 1986a). The scatteration of employment throughout the urban fringes, combined with the continued suburbanization of housing, is creating a more fractured settlement pattern in many regions. As a result, commuting patterns are becoming more and more complex, with multiple origins and destinations, thus casting some doubt on the abilities of transit and even ridesharing to survive in these setting. In 1980, for instance, over 40% of all home-work trips in the U.S. took place wholly within suburbs, exceeding the number of

suburb-to-central city trips by more than two-to-one (Fulton, 1983). Only a transportation system which emulates the interconnectivity of a telephone network, some argue, can thrive in this environment, namely the automobile (Webber, 1984).

The proliferation of office parks, shopping malls, urban villages, and other congregations on the suburban fringe will require a renewed commitment to transportation and land use planning if serious mobility problems are to be headed off. Many master-planned suburban office and retail developments are built on such a large scale that they are effectively pre-ordained for auto use. Most consist of expansive one- to two-storey buildings set far away from individual property lines, often lacking any physical integration or transit amenities. Restrictive covenants, moreover, often place strict limitations on heights and require wide sidelots, abundant parking, and easy-access frontage roads. Although many industrial and warehousing parks require horizontally-scaled single storey plants for production and assembly purposes, there are really no compelling reasons for scaling office structures horizontally other than for aesthetics and to exploit cheap land prices. The consequence, however, is to create an environment where workers must rely on their automobiles for circulation.

Certain design practices, such as the clustering of buildings around open concourses and the provision of front-door bus access to main entrances, could enhance the pedestrian and transit orientation of many outlying office centers. Several recently-constructed office parks stand out as exemplars of pedestrian-oriented site planning. The Harbor Bay Isle Business

Park, a 325-acre R&D center in Alameda, California, has introduced landscaped walkways, pedestrian concourses, and on-site transit connections to encourage travel alternatives to the automobile (ULI, 1983). On-site provision of transit shuttle services, bus turn-outs and shelters, curvilinear cycle and pedestrian paths, and preferential rideshare parking also characterize the Bishop Ranch and Hacienda Business Park projects, two office mega-developments 35 miles east of downtown San Francisco (Cervero, 1986a).

The staging of business park developments can also help control suburban traffic conditions. Careful project phasing can ensure that necessary roadway and transit improvements coincide with new office and retail construction. In addition, office and industrial parks should ideally be phased-in with the construction of nearby affordable housing. Office park developers, however, have so far shown little interest in either building on-site housing or encouraging the staged construction of residences nearby, principally because there is relatively little profit to be made (Cervero, 1986a). Moreover, few regional institutional mechanisms have emerged for successfully balancing suburban employment and housing development. Rather, municipalities typically vie for new corporate investments in hopes of expanding their tax bases, with unsuccessful bidders often becoming repositories for track housing subdivisions. This laissez-faire approach toward suburban employment and residential development has served to widen the job-housing imbalance in many regions.

With the decentralization of jobs, one would expect less of a jobs-housing imbalance in coming years. However, evidence suggests that more suburbanites are living farther from their workplaces than ever. From 1977 to 1983, for instance, the mean journey-to-work for Americans residing outside of a central city increased from 10.6 miles in length to 11.1 miles (Klinger and Kusmyak, 1986). Research shows that shortages of affordable housing and exclusionary zoning practices have displaced many suburban workers, forcing them to reside outside of their community of employment (Cervero, 1986b). Already, most suburban communities in the San Francisco Bay Area that have experienced tremendous job growth during the 1980s have far more workers than housing units, with the ratio of jobs-to-housing exceeding two in places like Palo Alto, Sunnyvale, and Santa Clara.

While there was a logic to separating residences from smokestacks and slaughterhouses during the industrial era, in today's environment of non-polluting office developments, there real is no compelling basis for strictly segregating places of residence and work. The original purpose of zoning was to prevent nuisances by regulating land uses. Today, however, the "nuisance" facing most suburban areas seems to me more one of traffic congestion rather than non-compatible uses. We should, therefore, turn the problem on its head and zone for jobs-housing integration as a way to mitigate the "traffic nuisance". Inclusionary zoning that links housing and office development should be required for all large-scale master-planned projects. Fair-share housing programs should also be pursued to ensure that housing targeted to the incomes of clerical and service-industry

workers is provided nearby.

The need for fusing together suburban land uses goes beyond job-housing integration. Unless restaurants, stores, recreational facilities, and the like are also sited close to employment centers, most workers will find it necessary to commute by car in order to access lunchtime activities. Denver's Technological Center, an 850-acre suburban office development, also offers its 12,000 employees a panoply of midday and evening activities by providing on-site shops, restaurants, cinemas, a health center, and a hotel (Galehouse, 1984). By creating a village atmosphere with numerous support services for its tenants, the Tech Center has become a highly marketable, self-sustaining development. Moreover, the share of commuters traveling to work via carpool, vanpool, or bus has rocketed from under 5 percent in the early 1970s to nearly 25 percent today.

Numerous other strategies are currently being pursued to cope with the impending mobility problems posed by suburban and exurban growth, including the emergence of employers associations to manage traffic, the hiring of transportation coordinators to match ridesharers, joint public-private financing of roadway improvements, and the enactment of trip reduction and traffic mitigation ordinances (Eager, 1984; Cervero, 1984b; Cervero, 1986b; Orski, 1985). Employers in places as diverse as El Segundo, California, Hartford, Connecticut, and Post Oak, Texas have banded together to operate shuttle bus services, subsidize carpooling, and finance corridor highway improvements to ensure their businesses remain accessible for both their employees and

customers. At the Denver Technological Center, a fee levied on all employers has been used to finance a successful ridesharing and private bus service, along with major freeway and arterial signalization improvements (Egar, 1984). Moreover, the City Post Oak Association, responsible for managing the travel of 65,000 employees working at the office and retail mega-complex six miles from downtown Houston, has helped finance the operation of 100 vans serving 1,200 employees.

Still, a number of nagging problems have hampered many suburban transportation management programs to date. For one, employees' residences are usually widely scattered, making carpool matching difficult. Moreover, workers in places like the Denver Technological Center are often spread over several miles of an office park without an internal circulation system. Plentiful free parking, a trademark of most suburban complexes, can also deter ridesharing. Finally, while master-planned projects housing only a few large tenants offer ample opportunities for employee trip coordination, such is not the case along corridors dotted by multiple smaller office developments. Yet the cumulative traffic impacts of numerous loosely-organized office and retail centers can be every bit as troublesome as large-scale megaprojects. An example of this is the Highway 101 peninsula corridor linking San Francisco and San Jose, where 25 million square feet of mixed office, commercial, and hotel development spread over 55 separate projects has been approved. While individual municipalities awarded each project a negative declaration in their environmental review of traffic impacts, regional planners estimate the cumulative effects of

these developments will quickly overwhelm the 6-lane freeway corridor (MTC, 1983).

Recent legislation has been introduced in a number of suburban settings to mitigate the traffic impacts of new large-scale developments. Pleasanton, California has passed perhaps the most far-reaching trip reduction ordinance to date. There, no company with fifty or more workers can have over 55 percent of its work force driving alone to work during peak hours in 1988 (Currey and Fraser-Middleton, 1985). Stiff penalties are being assessed for non-compliance with ordinance. So far, Pleasanton's ordinance seems to be having an impact -- over one-half of all workers now commute outside of the designated afternoon peak hour and nearly one-quarter carpool, vanpool, or patronize mass transit to work.

Instead of regulating demand, some suburban communities have recently passed ordinances requiring developers to pay fees to cover of new infrastructure necessitated by their projects. A new Orange County ordinance requires developers to pay impact fees on all new construction in three corridors in which new freeways are planned (Orski, 1985). The fees are being assessed against individual developments located in the highway corridor, pro-rated on the basis of their projected contribution to congestion. The levies are expected to generate \$630 million, more than 60% of the total freeway project cost. In Montgomery County, Maryland, moreover, private developers are backing an "Impact Fee District" as a means for financing at least 50% of the needed highway and traffic management improvements for a

rapidly developing corridor.

The most far-reaching impact fee program is probably Los Angeles's. For a twelve square mile area around Los Angeles's international airport, a one-time fee of \$2,010 is being collected from developers for each afternoon peak-hour trip that will be generated on a typical day. Fees are being accumulated in a bank account to help finance \$235 million in areawide transportation improvements. Developers can earn credits against fee obligations in a variety of methods, including dedicating land for future LRT lines, building pedestrian bridges, and subsidizing ridesharing or employee transit passes. Although property-owners are generally supportive of the proposed ordinance, some grumbling over its fairness has been aired. In particular, several developers have complained that they are being forced to foot the bill for costly infrastructural improvements while long-establish businesses whose customers and workers contribute equally to traffic congestion pay nothing. Fashioning programs that distribute fees equitably among existing and new developments remains an imposing challenge in both Los Angeles and elsewhere.

Not all areas have gone the ordinance route toward suburban traffic mitigation, choosing instead to negotiate with developers on a case-by-case basis. The Irvine Company, for instance, has entered into an agreement with the City of Irvine to provide over \$500 million toward constructing several new parkways, freeways interchanges, and a host of traffic control improvements near the Spectrum development, a massive bio-technology and multi-use complex taking form in central Orange County. To the

south in San Diego County, developers of Rancho Carmel, a 1,500 acre mixed-use development, have contributed \$58 million worth of freeway improvements, park-and-ride facilities, bike trails, and a computerized traffic control system (Orski, 1985). Statewide, nearly a billion dollars have been pledged by private developers for state highway improvements alone in California through 1989.

Several public entities have followed the lead from private developers in negotiating packages that link transportation improvements to land development. Bellevue, Washington, a rapidly developing retail/office subcenter east of Seattle, recently entered into an agreement with the regional transit authority which links bus service to various municipal land use commitments (Noguchi, 1982; Egar, 1984). The agreement enables downtown Bellevue to earn up to 5,000 annual bus hours of "incentive" service under a formula that recognizes the city's progress towards increasing employment densities and reducing the parking ratio. Bellevue has rapidly transformed its core from a low-density, auto-dominated setting into one that is more mid-rise in profile and pedestrian-centered. Major reductions in parking requirements, along with the recent passage of an ordinance that stipulates a 35% ridesharing target for all new office projects, aim to further cement the transit and pedestrian orientation of downtown Bellevue.

In close, a number of inventive programs have been put into place that offer hope for balancing land use and transportation initiatives in suburban America. It is essential, however, that site-specific and municipal-level planning decisions be

supportive of larger regional goals. Many transportation management programs that have been launched to date, however, have all too often been narrowly focussed. The lion's share of developer-financed roadway and signalization improvements around office parks, for instance, have been adjacent to specific projects. As a consequence, the downstream effects of as many as 20,000 new trips being generated by a new employment center are overlooked. Near-site improvements can contribute little to the vehicular capacity of an area if other regional improvements are not built in tandem. This lesson was brought to light in the case of a \$9 million developer-financed four-lane highway expansion in McLean, Virginia that abruptly changes into a narrow two-lane road at the owner's property line (Shoppert and Herald, 1984). Only through a collaborative regional planning effort can such problems be averted.

CONCLUSIONS

The literature is replete with both good and bad accounts of complementary transportation and land use planning. Emerging challenges in the field, however, will clearly require us to go beyond simply replicating past success stories. Powerful demographic and economic forces are irrevocably changing how we travel. A reaffirmation of traditional transportation and land use planning principles, combined with the formation of responsive institutional arrangements, are essential as we face new frontiers in the field. In particular, a return to earlier principles of visionary and comprehensive planning is called for.

Our efforts must certainly go beyond simple pledges to

blueprint the future, however. One common denominator of recent accomplishments in the field has been the expanding role of the private sector. Public-private partnerships have been particularly encouraging. Mutual sharing of the benefits and costs associated with transportation investments has obvious virtues and will work as long as win-win situations can be negotiated. There is a common misconception that private developers and public agencies are long-time adversaries on most transportation matters. To the contrary, most developers, whether promoting sprawling office parks or high-rise towers over subway air-rights, are more than willing to pay their fair shares simply because they realize the long-term profitability of their investments depend crucially on good access and orderly growth. One guarantee most developers insist upon, however, is that the 'rules of the game' will not change sometime latter. Many developers, for instance, have resisted ridesharing programs as partial offsets for reduced on-site parking largely on the grounds that there could be no assurances that such programs would be around years later. Parking is perceived as a risk-free, one-time, permanent investment while carpools are often viewed as "soft programs" that can easily go awry given factors outside the developer's control, such as declining fuel prices. Some lending institutions, moreover, have blocked past attempts to substitute vanpools for parking because of the uncertainties and risks involved.

Other obstacles could likewise stymie future private initiatives in transportation. Notably, the legal authority for exacting cash contributions from private developers to finance

off-site highway and transit improvements remains clouded in some states. Courts in California and Florida have recently ruled that any fees levied against new development must be earmarked for capital expansion necessitated by the development (Stegman, 1987). San Francisco's recent attempt to impose a "transit impact development fee" on all new downtown construction was tied up in courts for several years on the very grounds it was a tax in disguise, thus a violation of California's Proposition 13 tax ceiling. Such legal challenges could limit private participation to "band-aid" initiatives targetted only site-specific problems.

Wider participation of the private sector in transportation matters will hinge on our abilities to more accurately gauge both the accessibility benefits of new transportation investments and the incremental congestion costs imposed by new land developments. Differences of opinions between public agencies, developers, banks, and courts could largely be resolved if there was some degree of consensus over the measureable benefits and costs associated with joint development projects. Additional research is also needed on defining the boundaries of future joint public-private endeavors -- i.e., where they might best work, how extensive they might be in scope, and what unique institutional and legal arrangements could best sustain them. Finally, more attention needs to be devoted towards designing incentive programs that elicit voluntary cost-sharing responses from the private sector in contrast to the more common approach of imposing mandatory impact fees.

In conclusion, synchronized transportation-land use planning offers a solid foundation for pursuing joint development programs, guiding multi-centered growth, and preserving mobility around booming suburban office corridors. The recent drift away from traditional transportation-land use planning in favor short-range term traffic management programs is troubling and must be reversed if future transit and roadway investments are to serve as effective levers for guiding growth. Jobs-housing balancing and integrated land development, moreover, offers the most enduring basis for staving off suburban congestion and preserving regional mobility. Building upon the lessons of the past several decades, our challenge is to create new institutional forums and methodological styles that will reaffirm traditional transportation and land use planning as a normative process in the 1990s and beyond.

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