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Transit-Oriented Development and Joint Development in the United States: A Literature Review

This digest summarizes the literature review of TCRP Project H-27, "Transit-Oriented Development: State of the Practice and Future Benefits." This digest provides definitions of transit-oriented development (TOD) and transit joint development (TJD), describes the institutional issues related to TOD and TJD, and provides examples of the impacts and benefits of TOD and TJD. References and an annotated bibliography are included. This digest was written by Robert Cervero, Christopher Ferrell, and Steven Murphy, from the Institute of Urban and Regional Development, University of California, Berkeley.

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I. INTRODUCTION

Transit-oriented development (TOD) has gained popularity as a means of redressing a number of urban problems, including traffic congestion, affordable housing shortages, air pollution, and incessant sprawl. Several factors have heightened the public interest in TOD. One is a receptive policy environment, marked by recent legislation and grant funding—at all levels of government—committed to promoting "livable communities" and "smart growth." Over the past few years, several federal initiatives have explicitly sought to leverage TOD: new transit joint development policies, including a more permissive interpretation of the federal common-grant rules; "new starts" criteria that explicitly weigh attention given to coordinated transit and land use in evaluating proposals for major capital investments in transit; and the location efficient mortgage (LEM) program, underwritten by Fannie Mae, that makes it easier to qualify for a loan to purchase a home situated near transit.

A host of demographic factors have also worked in favor of TODs—e.g., increasing shares of childless couples, influxes of foreign immigrants (many of whom come from countries with a heritage of transit-oriented living), and growing numbers of empty-nesters seeking to downsize their living quarters. These groups form ready-made consumer markets for housing situated near transit nodes.

Steadily worsening traffic congestion has also spurred TOD initiatives. In many parts of the United States, traffic woes have created a cohort of individuals who are drawn to the idea of living near transit and enjoying a less stressful commute to work. More and more businesses are also locating near rail stops (e.g., the Discovery Channel's new headquarters adjacent to the Silver Spring Metrorail station; BellSouth's new headquarters under construction above the Lindberg station), in part to open up more commuting and housing options for their work forces. To some, TOD equates with good business.

Closely related to TOD is transit joint development (TJD). While the distinction between the two is not always clear, in general their differences lie with scale. TOD generally encompasses multiple city blocks, representing more or less a neighborhood in size and character. TJD, on the other hand, tends to be project-specific, often occurring within a city block and tied to a specific real estate development. Whereas TOD is often spearheaded and choreographed by a public agency, TJD usually occurs through a partnership of public and private interests working in tandem to achieve "win-win" outcomes, whether in the form of air rights leasing of publicly owned space, station-connection fees, or the joint sharing of capital-construction costs.

Over the years, various physical-design principles have surfaced for building TODs and (to a lesser extent) TJDs (Calthorpe 1993; Bernick and Cervero 1997). Most involve some combination of intensifying commercial development around stations, inter-mixing land uses, layering in public amenities (e.g., civic spaces, landscaping), and improving the quality of walking and bicycling. The challenges of creating successful TODs and TJDs, however, are more than physical in nature. Attention must also be given to such matters as personal security, economic and community development, cultural history, building social and human capital, and strengthening the bond between transit and the neighborhoods it serves.

While the concepts of TOD and TJD enjoy broad appeal, in truth the gulf between theory and practice remains huge. To date, America's track record at implementing successful TODs has not been impressive. Some have

failed financially. Laguna West, for instance, was originally touted as a TOD prototype for the suburbs of Sacramento, but a downturn in the real estate market at the time the project was coming on line led to eventual bankruptcy. Hoped-for TODs in some parts of the United States have failed to break ground because of unrealistic market expectations. To date, relatively little development has occurred around light rail transit (LRT) stops in St. Louis, Pittsburgh, and Buffalo because of tepid real estate conditions and stagnant growth in rail-served corridors.

Experience shows that, if they are to have much chance of success, TODs must be proactively championed by the public sector. Upon the opening of the Bay Area's BART system in the early 1970s and other urban rail systems that soon followed, many thought that transit-oriented land uses would spring up around stations naturally, without the need for public-sector encouragement or intervention. This view was buttressed by experiences in Toronto and Montreal, where even a casual observer could see a close correspondence between transit facilities and real estate development patterns (Urban Land Institute 1979). Absent a proactive and rock-steady commitment to station-area development, relatively little Canadian-style clustering of activities occurred around newly opened U.S. rail stations during the second half of the twentieth century (Huang 1996; Cervero and Landis 1997). Canada's tradition of regional governance has also been credited with orchestrating the co-development of land use and transit investments (Knight and Trygg 1977; Pill 1979).

Transit joint development has also faced uphill struggles. During its first five years, the Dallas DART system failed to spawn much in the way of formal TJD because, in the words of the system's manager for systems planning, "nobody sees DART as an asset" (Salvensen 1996, p. 35). Developer contributions to The City Place station never materialized because of a downturn in the local real estate market.[1] In the minds of many, the risks of TJD remain unacceptably high. According to the Urban Land Institute (1979, p. 2), "rather than being a theoretical misunderstanding of market phenomena, the main problem in the execution of joint development appears to be that both the public and private sectors lack sufficient knowledge of the complexities of joint development."

Despite such obstacles, numerous U.S. cities have helped bring some semblance of TODs to fruition. On the west side of Portland, Oregon, the master-planned community of Orenco has taken form around a newly opened MAX light rail station in Hillsboro (Arrington 2000), featuring a multitude of housing product-lines, a neighborhood retail district, and an attractive promenade that links residents to the rail stop. Along San Diego's Mission Valley Trolley corridor, the Hazard Center has evolved into a successful mixed-use, pedestrian-scale community huddled around a light rail station. In downtown San Diego, mid-rise housing has been constructed near several Trolley stations, leveraged through initiatives undertaken by the Centre City Redevelopment Corporation. The most financially remunerative TJD project to date has been the Bethesda Metro Center (Photo 1), an office-retail-hotel project that sits atop the Bethesda Metrorail station (Maryland) and generates $1.6 million annually in air rights rent for the Washington Metropolitan Area Transit Authority (WMATA). This sum will likely be eclipsed by the leased payments generated by the planned 32-acre office-retail-residential project at the White Flint station in Montgomery County.

[1] While there has been relatively little TJD around DART stations, there has been a fair amount of activity on the TOD front: "Since the opening of the system in 1996, more than $800 million in new commercial and residential investment within walking distance of the DART line has either been constructed or is in process" (Hartzel 2000).

Photo 1. Bethesda Metro Center: America's Biggest Joint Development Money-Maker. The Metro Center in downtown Bethesda, Maryland features 378,000 square feet of office space, a 380-room Hyatt Hotel, and 60,000 square feet of retail space. The project has spurred other nearby office, retail, and residential development within walkable distance, including a popular nighttime restaurant, arts, and entertainment district.

Today, one even finds TODs sprouting around commuter rail stops. Near the Mountain View CalTrain station, an 18-acre compact, mixed-use, walker-friendly neighborhood, called The Crossings, replaced a once-dying shopping mall. To leverage this development, the city of Mountain View created a Transit Overlay Zone that allowed higher densities, up to a maximum of 50 percent, within 2,000 feet of the station. Along New York's Metro-North commuter rail line, new housing and retail shops have recently been built on parcels near stations in century-old communities like New Rochelle and Mamaroneck. In San Diego County, the cities of Oceanside and Carlsbad have crafted specific plans that incorporate TOD design principles for large open tracts near Coaster commuter rail stops.

A particularly noteworthy trend has been the adaptive reuse of former park-and-ride lots. At the Ohlone-Chynoweth station in San Jose, housing was recently built atop a former surface park-and-ride lot (Photo 2); current plans call for a similar transformation of the at-grade parking lot at the Owings Mills terminus of Baltimore's northwest light rail line. In both instances, public policies (redevelopment laws and livable community grants in the former case, and smart-growth legislation in the latter case) helped leverage the conversion of surface park-and-ride lots to infill, mixed-use real estate projects.

Of course, steel-wheel/steel-rail technologies have no monopoly on TOD and TJD. Abroad, some of the most successful TODs and TJDs over the past decade have occurred in and around busway stations—notably, in Ottawa, Canada, and Curitiba, Brazil (Cervero 1998A; Parsons, Brinckerhoff, Quade and Douglas et al. 1995). In 1998, the federal Transit Administration (FTA) launched a bus rapid transit (BRT) demonstration program that has funded BRT pilot initiatives in 10 U.S. cities, setting the stage for possible new types and forms of TOD and TJD projects. Existing examples of bus-based TJD include Denver RTD's air rights lease at the southern end of the 14-block Transitway Mall, the Santa Ana Transportation Center in Orange County, California, and the Corpus Christi Staple Street Transit Center (recipient of a National Presidential Design Award and funded through a Livable Communities Initiatives grant). Bus-based TODs are currently taking form in San Diego's mixed-use Uptown District, put together under the leadership of the city of San Diego, and are also being aggressively planned in North Carolina for Charlotte's northeast and northside BRT corridors.

Reasons given for pursuing TODs in these and other areas vary, though most draw upon growing concerns over the environmental, economical, and social sustainability of sprawl and an increasingly automobile-dependent society. In the minds of many local elected officials, TODs offer hope, if only to a modest degree, of stemming traffic

Photo 2. Adaptive Reuse of Parking Lot at Ohlone-Chynoweth Station, San Jose, California. Below-market-rate housing, built by a non-profit corporation, Eden Housing, sits atop the former surface parking lot of the Ohlone-Chynoweth light rail transit station of the Santa Clara Valley Transit Authority (SCVTA).

congestion, air pollution, energy depletion, and the social disintegration of cities and neighborhoods. As voters express growing concerns over quality of life, TOD and TJD have gained political saliency.

It is important to recognize that TODs are not just about enhancing ridership and improving traffic conditions. It could very well be that the benefits of TOD have less to do with transportation and more to do with widening choices on where to live and how to travel, rejuvenating urban neighborhoods, bringing more people into everyday face-to-face contact, and engendering more social and cultural diversity in suburbia (Duaney et al. 2001; Calthorpe and Fulton 2001).

I.1 Defining Transit-Oriented Development

Various terms have surfaced over the years to convey the idea of TOD, such as "transit villages," "transit-supportive development," and "transit-friendly design." TOD is the most widely used term, however, and is thus what we will use here. Some authors use the term TOD quite liberally, referring to any form of "transportation-oriented development," including bus- and rail-oriented development as well as development along freeways (Lefaver 1997). This review takes a narrower definition, referring to development near or oriented to mass transit facilities. While there is no single, all-encompassing definition that represents the TOD concept in its many forms, most definitions of TOD nonetheless share common traits.

The following represents a sample of TOD definitions found in the literature:

- "The practice of developing or intensifying residential land use near rail stations" (Boarnet and Crane 1998A).
- "Development within a specified geographical area around a transit station with a variety of land uses and a multiplicity of landowners" (Salvensen 1996).
- "A mixed-use community that encourages people to live near transit services and to decrease their dependence on driving" (Still 2002).
- "A compact, mixed-use community, centered around a transit station that, by design, invites residents, workers, and shoppers to drive their cars less and ride mass transit more. The transit village extends roughly a quarter mile from a transit station, a distance that can be covered in about 5 minutes by foot. The centerpiece of the transit village is the transit station itself and the civic and public spaces that surround it. The transit station is what connects village residents to the rest of the region…The surrounding public space serves the important function of being a community gathering spot, a site for special events, and a place for celebrations—a modern-day version of the Greek agora" (Bernick and Cervero 1997, p. 5).

- "Moderate to higher density development, located within an easy walk of a major transit stop, generally with a mix of residential, employment, and shopping opportunities designed for pedestrians without excluding the auto. TOD can be new construction or redevelopment of one or more buildings whose design and orientation facilitate transit use" (California Department of Transportation 2001).

- "A place of relatively higher density that includes a mixture of residential, employment, shopping and civic uses and types located within an easy walk of a bus or rail transit center. The development design gives preference to the pedestrian and bicyclists, and may be accessed by automobiles" (Maryland Department of Transportation 2000).

- "A mix of residential, retail and office uses and a supporting network of roads, bicycle and pedestrian ways focused on a major transit stop designed to support a high level of transit use. The key features of TOD include (a) a mixed-use center at the transit stop, oriented principally to transit riders and pedestrian and bicycle travel from the surrounding area; (b) high density of residential development proximate to the transit stop sufficient to support transit operations and neighborhood commercial uses within the TOD; and (c) a network of roads, and bicycle and pedestrian paths to support high levels of pedestrian access within the TOD and high levels of transit use" (Oregon Revised Statutes, Section 307-600-1: www.leg.state.or.us/95reg/measures/hb3100.dir/hb3133.en.html).

While such definitions vary in scope and specificity, most TOD definitions share several common elements:

- *Mixed-use development*
- *Development that is close to and well-served by transit*
- *Development that is conducive to transit riding*

Less universally subscribed to, though found in some definitions of TOD, are the following traits:

- *Compactness*
- *Pedestrian- and cycle-friendly environs*
- *Public and civic spaces near stations*
- *Stations as community hubs*

Some observers have sought to categorize TODs. White and McDaniel (1999) have identified six forms of TODs spanning different geographic contexts: (1) *Single-Use Corridors*: concentrations of single transit-intensive uses (e.g., office or retail) in transit corridors; (2) *Mixed-Use Corridors*: concentrations of a variety of land uses on a single parcel or group of parcels within a transit corridor; (3) *Neo-Traditional Development*: development that primarily focuses on design features that reproduce traditional town or village settings with small lots, narrow streets, detached parking behind houses, reduced setbacks, and front porches; (4) *Transit-Oriented Development*: compact, mixed-used development concentrated near transit stops; (5) *Hamlet or Village Concept*: focuses single-family homes around a central green area or commons; and (6) *Purlieu*: A development of approximately 150 acres and 7,000 residents, with comprehensive and detailed design regulations, but few use restrictions.

Notwithstanding these and other definitions, in much of the written literature, TODs are discussed in general, often abstract terms, so much so that a new term has emerged—"transit adjacent development," or TAD (Parsons, Brinckerhoff, Quade and Douglas 2001A). A TAD is just that—development that is physically near transit; it fails to capitalize upon this proximity, however, to promote transit riding. A TAD lacks any functional connectivity to transit, whether in terms of land-use composition, means of station access, or site design. A number of U.S. TODs discussed in the literature more

closely resemble TADs. Perhaps they aspire to one day become TODs, but the lack of consumer services, the absence of pathways and bike routes, or the presence of physical barriers render them as developments that are simply proximate to transit. Of course, one person's TOD is another person's TAD. As more *bona fide* TODs take form with the passage of time, progress can be expected in tidying the definition of what constitutes a TOD and what does not.

I.2 Defining Transit Joint Development

Within the broader scope of TOD lies the "art and science" of implementing TJD. Here, too, definitions vary.

In general, definitions of TJD fall into two groups: (1) general descriptions that treat it, somewhat generically, as small-scale TOD; and (2) more specific characterizations that tie it to explicit criteria. Examples of the former are the following:

- "Real estate development that is closely linked to public transit services and station facilities and takes advantage of the market and locational benefits provided by them" (Keefer 1984).
- "Development that occurs within a certain radius of a transit facility, which is configured differently than it otherwise would have been were transit not present" (Sedway Kotin Mouchly Group 1996).
- "Projects located on sites or that use air rights that were acquired by transit agencies to accommodate their facilities" (Salvensen 1996).
- "The development of real estate that is integrated with a transit station or other transit facility" (White and McDaniel 1999).

More specific definitions of TJD that add a fiscal, institutional, or legal dimension include the following:

- "A public-private partnership designed to decrease the costs of operating or constructing public transportation systems, stations or improvements through creative public-private financing arrangements" (The National Council for Urban Economic Development 1989).
- "Any formal agreement or arrangement between a public transit agency and a private individual or organization that involves either private-sector payments to the public entity or private-sector sharing of capital costs in mutual recognition of the enhanced real estate development potential or market potential created by the siding of a public transit facility" (Cervero et al. 1991).
- "Real estate transactions involving the development of private projects on publicly owned land or air rights" (Sedway Kotin Mouchly Group 1996).

A central element of TJD is the idea of a *quid pro quo* (Cervero et al. 1991; Landis et al. 1991). On the private side, the developer benefits because the accessibility advantages of being near a transit station are capitalized into higher rents or greater occupancy. On the public-sector side, the transit agency benefits through the sharing of construction costs, via cash payments, or potentially even gains in ridership. Since both sides are presumed to benefit from TJD, it is often considered as a "win-win" proposition.

TJD is often classified into two groups: (1) *revenue-sharing arrangements* and (2) *cost-sharing arrangements* (Cervero et al. 1991). Since public-private partnerships are ultimately financial propositions, this two-part distinction frames TJD along the lines of an accounting sheet: some initiatives work on the revenue side, benefiting the transit agency by securing a stream of revenue, whereas others aim to relieve transit authorities of some of the cost

burden of constructing, maintaining, or rehabilitating transit facilities. Examples of revenue-sharing include land leases; air rights development; and station interface or connection-fee programs, concession leases, and benefit assessment districts. Cost-sharing examples include sharing construction expenses, incentive-based programs that provide benefits (e.g., density bonuses) in return for off-loading construction costs, and joint use of equipment like air-conditioning systems.

A comprehensive evaluation of 117 TJD projects across the United States in 1990 found cost-sharing to be the most common approach, followed by station development (air rights or ground leases) and station concession programs (Figure 1). At the time, New York City led the nation in number of TJD projects, most of which consisted of cost-sharing agreements (in return for density bonuses). On a dollar basis, the Washington Metropolitan Area Transit Authority (WMATA) had collected the most revenue or off-loaded the most costs, mainly through ground leases or station-connection fees. A variant of TJD is co-development, wherein there is no direct sharing of revenues or costs between private interests and a transit agency, yet benefits accrue from coordinating projects, such as improved pedestrian circulation or more functional use of open space (Cervero et al. 1991). In 1990, informal co-development was thought to be more prevalent than formal joint development (Landis et al. 1991).

As with TOD, one finds fairly loose and liberal interpretations of TJD. Some published articles that profess to be about TJD actually pertain to the coordination of transit and land use in the broadest sense (Allen 1986). Montreal, for example, is a wonderful example of colorful and attractively designed pedestrian passageways that interconnect private buildings and rail stations, though it is a stretch to call these improvements joint development beyond the fact that the transit agency secures on-going revenues from concession leases.

Such literature only blurs the distinction of TJD from other practices that encourage development in and around transit stations.

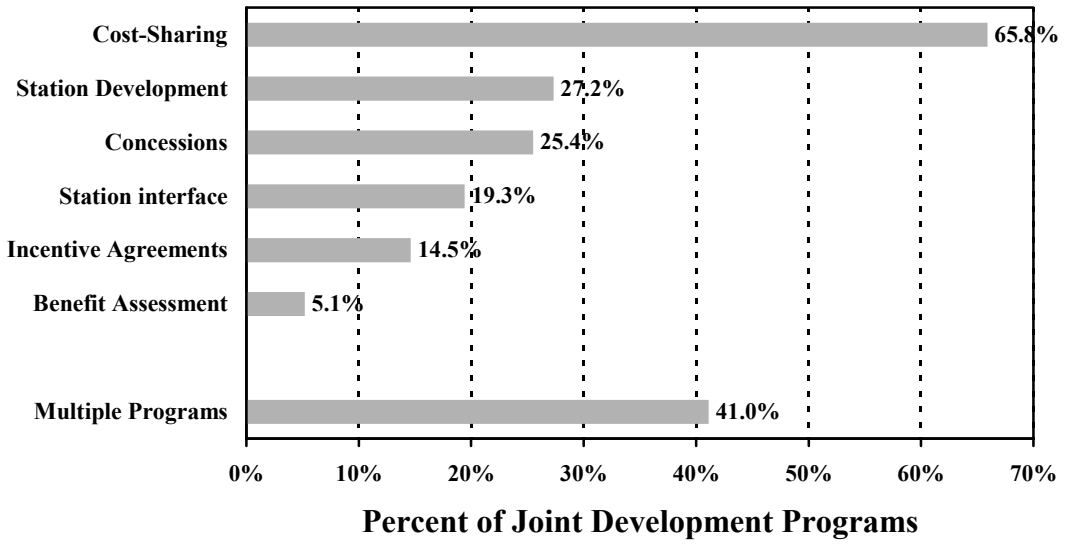


Figure 1. Distribution of Transit Joint Development Programs in the United States, 1990. Percentages sum to more than 100 percent since many programs involved multiple forms of joint development. *Source:* Cervero et al. (1991).

I.3 Literature Review

The principal aim of this literature review and the annotated bibliography found in the appendix is one of "place-setting"—to establish what we know and what we don't know about TOD and TJD. Secondary sources—comprising reports, articles, and books assembled from libraries, personal collections, and various public agencies—were relied upon in preparing this review. By identifying existing knowledge gaps, it is hoped that areas where additional research and study are most needed can be highlighted.

This literature review is divided into four main topics: Institutional Issues; Evaluation of Impacts and Benefits; Implementation; and Urban Design. While historical perspectives are provided on these topics, emphasis is given to current-day knowledge and programs. The literature review concludes with an overall summary of the industry's and research community's present state-of-knowledge regarding TOD and TJD.

II. INSTITUTIONAL ISSUES

Institutional issues that surround TOD and TJD span several key areas: community collaboration, community outreach, and normative roles for transit agencies, municipalities, and developers. In general, case studies have been turned to probing the institutional and organizational contexts of TOD and TJD.

II.1 The Need for Collaboration

Experiences show that successful TOD and TJD typically involve carefully crafted collaborations between the many individuals, organizations, and institutions with vested interests in outcomes, including developers, lenders, transit agencies, local and regional planning organizations, and public interest groups (Knight and Trygg 1977; Porter 1997; Cervero 1998B). The role of public transit as a mobility-provider is for the most part overshadowed by the political, economic, and institutional landscape of the neighborhoods, communities, and municipalities it serves (Parsons, Brinckerhoff, Quade and Douglas et al. 1995).

Even if there appears to be a burgeoning demand for living and working near transit, stakeholders must be sufficiently convinced that this demand is real and sustainable if they are to risk public and private capital creating a TOD. While opportunities for TOD or TJD abound, many economic and political factors stand in the way of successful implementation—impediments that can best be surmounted through the formation of public-private partnerships. In an appraisal of the state-of-practice, the National Council for Urban Economic Development (1989) encouraged the formation of partnerships focused on overcoming economic and political hurdles as a critical step toward implementing successful TJD projects.

Porter (1997) points to several potential obstacles that make public involvement necessary in spurring TOD:

- One obstacle is locational liability. Transit systems have rarely been set up to maximize development potential. Lines follow existing rights-of-way through unattractive industrial areas or terminate in suburban areas not slated for or conducive to high intensity development.

- A second obstacle is the real estate market cycle, which may delay station-area development, inhibiting the transit agency's ability to attract ridership. Market conditions along specific corridors also affect station-area development and accordingly should inform governmental policy in promoting TOD (Puget Sound Regional Council 1999).

- A third obstacle cited by Porter is non-supportive government policies such as exclusionary zoning, lot-size restrictions, and suburban-like building codes. Government strictures may disallow optimal mixes of uses, suppress densities, and impose inappropriate setback, height, or parking standards. The Puget Sound Regional Council (1999) has developed a detailed guide to conducting regulatory audits ensuring that transit-supportive policies prevail.

- A fourth obstacle is institutional barriers. Cross-jurisdictional cooperation is often necessary but difficult to achieve. Also, in attempting joint developments, transit agencies are usually "unaccustomed to assessing or taking the types of risks inherent in real estate development" (Cervero et al. 1992).

- A fifth obstacle is what Porter calls a "fixation on automobile-oriented design." In a survey of 19 rail systems in North America, Porter found that most prioritized park-and-ride lots over passenger-generating land uses near stations.

Building Partnerships

In a survey of 21 transit agencies with New Starts projects, Deakin et al. (2002) found that about a third of the respondent agencies had programs or projects in place that work cooperatively with local governments and the private sector to develop transit-supportive land uses around transit stations. For example, the Central Puget Sound Regional Transit Authority (Seattle, Washington) has formed a partnership with a non-profit housing organization to rehabilitate old housing stocks near transit stops along its planned LINK light rail project. In Austin, Texas, the local transit agency's private-sector outreach program, known as the Transit Opportunity Partnership, seeks the commitment of employers located near stations to provide transit subsidies as well as transit-supportive projects. In one case, a group of employers in a station-area office complex helped to fund a grocery store in order to facilitate trip reduction and transit use among employees.

Often, the partnerships that are necessary for TOD and TJD implementation also present obstacles. Getting staff and representatives from different public agencies with different missions to cooperate on such a project may require thinking and acting "outside the box." Changes in organizational behavior might also be in order. In Portland, Oregon, the city and Tri-Met needed to cooperate to build the downtown section of the light rail system. To encourage collaboration and efficiency, these two public entities opened a combined municipal and Tri-Met office for project management (the Office of the Downtown Project Manager), which housed staff from both agencies. Foisted upon each other, the respective staffs had little choice but to work and function as a team. In addition, the separation of the staff from their familiar agency environments served to focus their attention on problem solving and cooperation (Howard et al. 1985).

Collaboration, most sides agree, is the best antidote to TOD barriers. Collaboration is essential simply because everyone is dependent upon the actions of others in making transit-supportive development a reality. Banks must be willing to provide loans to real estate developers who want to bring about TJD. Local governments might need to follow with permissive zoning that allows higher densities and fewer parking spaces than the norm, which in some instances might require state-enabling legislation. Transit agencies might in turn need to realign bus routes to better serve a planned TOD. Or they might have to sell excess station-area land purchased with federal grants and thereby subject to federal control. And local residents have to be convinced that, on balance, a TOD will improve, rather than detract from, existing neighborhood conditions.

Multilateral arrangements can extend in many other directions. For example, not-for-profit housing corporations are also potential collaborators—a case in point being the Strobridge housing complex, consisting of 96 affordable units built by the Bridge Housing Corporation next to BART's Castro Valley station. Winning over the support of other often-neglected parties can also be crucial. In the case of proposed TODs in California, Oregon, and Virginia, developers have been caught in a crossfire between traffic engineers and fire marshals who complained that planned streets were too narrow (for safety and liability reasons) and neo-traditional planners who insisted they were too wide (and thus auto-centric). Insurance underwriters also have a potential voice in TOD outcomes. A proposal to increase density bonuses by 25 percent around several Los Angeles metrorail stations would have increased fire code rating;

this forced the city to back off a TOD proposal.

II.2 Collaboration and Partnerships

Among those who have studied the issues of collaborating and partnering on TOD and TJD, there is consensus that the spirit of cooperation must be fostered early and widely. This lesson applies equally to the public and private sector. According to the National Council for Urban Economic Development (1989), the normal sequence of events that lead to the point where a development plan is presented by a developer to the public sector is after it has already been completed. This effectively leaves out the public sector in crucial decisions about project phasing, land uses, and design characteristics, prompting misunderstandings and delay. To avoid these problems, key private- and public-sector entities should collaborate early on, if necessary entering into agreements that lay out public and private actions needed at each point in the phasing of the project and that clarify the positions and responsibilities of each party (National Council for Urban Economic Development 1989).

Successful partnerships must be framed around timelines spanning project conceptualization and completion. Each TOD may require different levels of effort at different stages to be successfully implemented. As a starting point in any TOD planning process, the Puget Sound Regional Council (1999) recommends establishing the following ground rules:

- Define a common set of objectives for TODs that may be used to "accurately assess the market potential" of station locations (p. 46).
- Clearly delineate responsibilities between public and private sectors, and identify specific responsibilities that might be shared.
- Establish realistic market expectations for the development of each station area.
- Understand that developers make decisions based primarily on the real estate market and not on the presence of transit.
- "Demonstrate public commitment to private investment" through a station-area plan that outlines "public investments necessary to spur private development" (p. 49).
- Consider location the "primary determinant of market potential" rather than type or level of transit service (p. 50).

II.3 Community Outreach

Many well-intended TOD projects have been stopped dead in their tracks by unforeseen community opposition. Original plans for the BART heavy rail system, for instance, called for the emergence of mid-rise apartments and office towers around the Rockridge, Ashby, and North Berkeley stations. However, neighbors pressured elected officials to substantially down-zone properties around the stations and place moratoria on building permits (Webber 1976, Cervero and Landis 1997). BART stations flanked by preexisting office towers have not been immune from not-in-my-backyard (NIMBY) backlash either; in the case of the Pleasant Hill station, for instance, so many apartment-dwellers now live near the station that they have (perhaps predictably) formed neighborhood associations that have successfully fought off efforts to strategically fill open parcels with large-scale commercial projects. Recently, BART and Contra Costa County concluded a series of charettes, building community support for transforming park-and-ride lots at

the Pleasant Hill station into some 440,000 square feet of office and retail space, up to 345 apartments and townhouses, as many as 50 for-sale housing units, a town square and community green, and a child-care center (Parsons, Brinckerhoff, Quade and Douglas 2001B).

Regional and local governments as well as transit agencies may all be involved in public outreach and education. In Portland, the regional governing body, Metro, actively engaged citizens in its year-2040 comprehensive planning process. Neighborhood meetings, public gatherings, and multimedia communications were used to build a united front supportive of creating mixed-use centers linked by transit. Metro's outreach effort enjoys broad support, in no small part due to its inclusiveness and focus on consensus building (City of Seattle 1999).

Regional governments and transit agencies can also work together in soliciting public input on development issues. In Raleigh, North Carolina, the transit agency and regional planning body jointly appointed a citizen's group charged with making recommendations on the design and form of communities around bus and fixed guideway service (White and McDaniel 1999).

Public outreach sometimes extends beyond neighborhood design issues. In Los Angeles, under the Neighborhood Initiatives program, the city has undertaken TOD with "a bottom-up perspective, encouraging small-scale, community-based involvement in everything from local planning to owning and operating smart shuttle services to rail nodes" (Cervero 1998B). Outreach can also go beyond bringing people together at public meetings to discuss and debate issues. San Diego's Metropolitan Transit Development Board (MTDB), for example, produced and distributed a video called "Cities in the Balance: Creating the Transit Friendly Environment" that offered visual images of well-designed neighborhoods near transit.

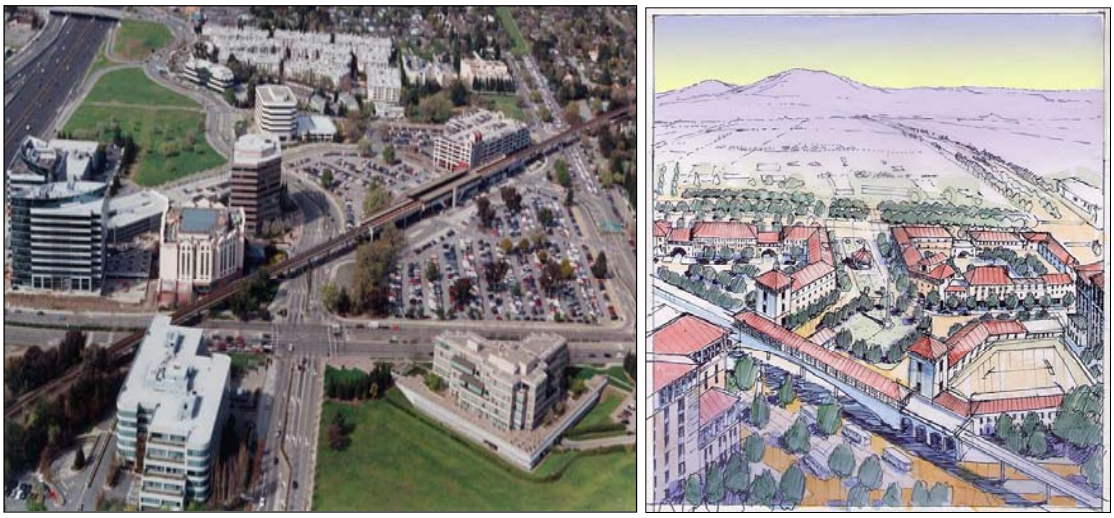
Outreach also extends to the nurturing of relationships between transit agencies and developers. Transit agencies often must solicit interest among developers, select a partner, and negotiate and broker deals. Many rail agencies today have fairly well-defined developer solicitation and selection criteria.

Solidifying community support can also be a critical element to help move local governments with land-use control to plan and zone for transit-supportive development. In a national survey conducted by Deakin et al. (2002), several transit agencies were found to have added public-outreach staff and aggressively funded participatory planning initiatives. In greater Seattle, the Central Puget Sound Regional Transit Authority has worked closely with local government staff and neighborhood associations in many critical planning and design phases of the LINK light rail project. The intent is to provide an open and inclusive framework for advancing the project and de-politicize investment decisions to the degree possible. The transit authority has also funded the local station-area planning activities as well as a series of neighborhood design charettes and citizen advisory efforts.

Regardless of outreach efforts, experiences show that densification does not readily occur in established neighborhoods due to local opposition and the simple fact that most

A Second-Generation TOD: The Pleasant Hill BART Station

BART's Pleasant Hill Station has been touted as one of America's more successful TODs, though in truth it has more of the characteristics of a TAD than a TOD. It has many buildings nearby, including some 2,400 housing units, and a rich mix of land uses, but it suffers woefully in terms of quality of walking environment and urban texture. After some two decades of slowly evolving into a suburban downtown clustered around an elevated transit station yet devoid of qualities of a European-style transit village, local officials realized it was time to go back to the drawing board. It was decided that a community-based charette process held the best chance of building broad-based consensus on how the Pleasant Hill station should be metamorphosed from a TAD to a TOD. Several firms were hired to run the design charette, and following an intensive six-month process of 'give-and-take,' a fairly strong consensus was reached that called for strategic siting and infill of mid-rise housing, community-oriented retail, offices, and assorted public amenities. Importantly, emphasis was given to providing attractive, accessible, and car-restricted spaces for pedestrians and cyclists. Also, attention was given to revamping implementation tools, mainly in the form of devising building and site-design codes based on new urbanism principles.



Pleasant Hill Station: From the present TAD (left) to a second-generation, master-planned TOD (right). *Source:* Contra Costa County Community Development Department, *Pleasant Hill BART Station Design Charrette Outcome*, Martinez, California, 2001.

cityscapes are firmly entrenched and not easily altered (Bernick and Cervero 1997; Porter 1997). This should give transit agencies pause as they think about where they will site future station facilities, particularly if they are inclined to use rail transit investments to guide urban growth.

II.4 Government Roles

All governmental entities have a role to play in bringing about TOD and TJD to some degree. The literature identifies a number of activities that federal, state, and local interests

need to pursue in bringing about transit-supportive development patterns.

Federal Roles

The primary role of the federal government in fomenting TOD is one of funding. About 18 percent of all funding from the Transportation Equity Act for the 21st Century (TEA-21), or roughly $36 billion between 1997 and 2003, was allocated to transit (Puget Sound Regional Council 1999).

The federal government can also promote collaboration among other levels of government and between the public and private sectors. One program that aims to bring about multilateral collaboration is the Transportation and Community and Systems Preservation Pilot Program (TCSP) of the Federal Highway Administration. It aims to address the relationship between transportation investments and private real-estate development; the Puget Sound regional council used it to fund station-area planning activities (1999). Perhaps the most significant program for encouraging collaboration is the Federal Transit Administration's New Starts program, which funds new construction and expansion of fixed-guideway transit. New selection criteria explicitly weigh the importance of transit-supportive existing land-use policies and foreseeable development patterns in appraising the likely cost-effectiveness of major capital investments in transit. The city of Portland has successfully exploited these criteria to increase its share of federal transit dollars.

State Roles

Several states have aggressively promoted TOD, usually through pro-TOD policy in state plans and key policy documents (Porter 1997). States have a number of tools at their disposal to leverage TODs, including state transportation plans, transportation improvement programs, growth management programs, and tax laws. The state of California, for example, passed a bill, the California Transit Village Act, that encourages local jurisdictions to plan more intensive development around rail stations, though it offers no direct fiscal incentives (Cervero 1998B). The state of Oregon has adopted a transportation planning rule that requires the state's four metropolitan planning organizations (MPOs) to design regional transportation plans that are capable of reducing per capita vehicle-miles-traveled (VMT) by between 5 and 10 percent within a 20-year period.[2] In 1993, the state of Florida exempted urban infill and redevelopment areas from level-of-service standards and required that local comprehensive plans incorporate multimodal transportation elements, including Transportation Demand Management (TDM) measures (Ewing 1997).

Regional Planning

In the United States, regional control of land uses is quite rare and, some argue, undesirable (Tiebout 1956). Still, others argue, some type of coordination of local land use and regional transit plans is necessary to bring about socially beneficial patterns of urbanization around transit stations (Knight and Trygg 1977; Cervero 1984, 1986). Porter (1997) cites Portland as the new North American model for regional planning and coordination of TODs, having replaced Toronto, whose growth over the past few decades has largely spilled beyond the jurisdictional control of regional planning authorities (Cervero 1998A). Portland's regionally elected government, Metro, recently adopted the 2040 *Regional Framework Plan*. The plan requires local jurisdictions to establish zoning that is consistent with the regional plan, including zoning for dense mixed-use centers near

[2] Oregon Administrative Rules, Section 660-12-35.

transit. In establishing employment and housing capacities for jurisdictions, Metro officials assumed more intensive development for vacant land near transit lines and less intensive development for parcels away from transit (Metro 1997).

For most U.S. regions, councils of local governments come the closest to Portland-style regional planning, though most operate with little statutory authority and limited purse-string powers. These MPOs exist mainly to build consensus on issues of regional importance, meet state and federal regulatory requirements, broker capital improvements programs, and generate regional population and employment projections. Some MPOs have been more aggressive than others in promoting TOD, such as by providing planning grants and incentives for affordable housing production near transit stops. MPOs can also enact policies that support TOD within regional transportation plans (RTPs) with the expectation that such policies will influence how money gets doled out among competing projects in transportation improvement programs (TIPs). Sacramento's metropolitan transportation plan, for example, contains a policy of advancing proposed transportation projects in its funding process that "facilitate higher-density or mixed-use development as a means of affecting travel behavior" (Porter 1997, p. 17).

Local Government Roles

Since land-use regulatory and zoning controls are the prerogatives of local governments, municipalities and counties are often better positioned to influence TOD outcomes than any governmental entity. Local governments can show their support for TOD through general plans, transportation plans, station-area plans, and special zoning provisions (Porter 1997). The cities of Atlanta and San Diego, for instance, have created overlay zones that allow higher density and more land-use mix options for station areas (Porter 1997; Cervero 1998B). In the greater Portland area, the cities of Portland, Hillsboro, and Beaverton as well as Washington County have all incorporated transit-supportive design guidelines into their development codes. Hoping to channel growth to its light rail corridor, the city of Sacramento opted to allow higher density uses near rail stations "as a right" in designated areas. In 1992, San Diego's city council opted to replace Euclidean zoning with a bonus-based land guidance system that rewards mixed-use, infill development near Trolley stops in designated smart-growth corridors (Cervero 1998B). Local governments can also leverage TOD by expediting development review processes. The city of Los Angeles, for example, fast-tracks developments that are within walking distance of Metro stations and gives priority to their permits (e.g., sewer and water) (Cervero 1998B).

Local governments may also be involved in creating station area plans, which function as scripts for guiding public and private investments in and around transit stops. Porter (1997, p. 20) argues such plans "offer an important boost to transit-focused development." Several studies have outlined the key components of TOD-friendly station-area plans (Porter 1997; Puget Sound Regional Council 1999; Metropolitan Council 2000), including the following :

- *Results of a market feasibility study.* According to the Puget Sound Regional Council (1999), local governments are usually best positioned to perform station-area market analysis, though transit agencies sometimes are able to conduct such assessments just as well.

- *A physical plan for streets, pathways, utilities, mitigations and community enhancement.* Some observers recommend establishing a capital improvements program that clearly denotes

public commitments and responsibilities for physical supporting TODs.

- *A land-use plan*. In addition to being prescriptive, the plan should identify specific steps that need to be taken to create the densities and land-use mixes necessary to support and sustain future transit services.

- *A staging plan*. Land-use planning tends to be spatial in nature; however, attention must also be given to the phasing of major improvements over time, specifying who will do what and when.

- *Regulatory and fiscal incentives*. Good station-area plans not only lay down the rules but also offer incentives, such as tax abatement or density bonuses, that reward developers for actions that support TOD.

Redevelopment Agencies

In marginal and depressed urban settings, redevelopment agencies have been the primary catalysts for TOD. Not all states have redevelopment laws, but in those that do, like California and Virginia, redevelopment agencies have proven to be effective entities at breathing life into once-depressed station areas. This is partly because redevelopment authorities often have greater land-development powers than transit agencies and sometimes even greater controls over development (e.g., affordable housing mandates) than localities. In San Diego and the San Francisco Bay Area, redevelopment agencies have donated or underwritten the cost of land for purposes of enticing private investment to station areas (Cervero 1998B). Redevelopment agencies have also helped assemble land in neighborhoods surrounding stations that otherwise would have deterred development because of small-lot parcelization among multiple land-owners. Lefaver (1997) claims redevelopment agencies are generally more effective than transit agencies in assembling land in TOD settings. However, because statutory laws often limit redevelopment agency powers to specified districts, it may be necessary for the transit agency to amass land through the open market and deliver good-size parcels to developers if TOD is to occur. Where transit agencies are able to exercise their power of eminent domain to assemble land (such as acquiring remnant parcels), they can be particularly effective at leveraging TOD. Los Angeles's Metropolitan Transit Authority (MTA) is one such example.

Redevelopment agencies have also provided much-needed financial assistance, principally through tax-increment financing (TIF). In the case of the Pleasant Hill BART station, the Contra Costa Redevelopment Agency used TIF to pay for the undergrounding of utilities and for drainage and water system improvements (Bernick and Cervero 1997). Other means of financial assistance have also been used as well, including tax-exempt bonds, low-interest loans, loan guarantees, and grants as well as direct equity participation. In depressed settings with weak real estate markets, redevelopment agencies have had to go the extra distance in promoting TODs, such as accepting below-market rents and deeply discounting land costs (Cervero 1998B).

Redevelopment agencies bring certain assets to the table when building partnerships. As the city of Seattle moves forward in constructing the LINK light rail system, it is exploring ways to partner with the regional transit agency, Sound Transit, via its planning department and redevelopment agency. Under its current legislative authority, Sound Transit is able to acquire excess land under certain conditions while the city can take the lead in providing redevelopment incentives, such as through tax-exempt bond financing.
The city's redevelopment office also has a much longer résumé than the transit agency when dealing with landholders, whether for purposes of condemning and acquiring

properties or for negotiating with seasoned real estate developers on entering into station-area ground leases.

II.5 Transit Agency Roles

Transit agencies can assume many roles in the TOD and TJD process—brokers, facilitators, educators, funders, active development partners, and advocates. Sometimes these roles are co-dependent—e.g., equity participation requires a certain degree of advocacy and mediation. Some are potentially in conflict—e.g., advocacy itself might compromise the ability of a transit agency to act as an impartial mediator.

A transit agency might opt to control the development process through requests for proposals (RFPs), negotiate deals with private developers more or less as equal partners, or delegate exclusive negotiating rights under the premise that they might be better positioned to attract private capital (such as in the case of the Ballston Metro Center) (Miller 1993). Alternately, an agency might opt to seed TODs by bankrolling station-area planning, as in Portland, Seattle, Minneapolis, and Sacramento (Parsons, Brinckerhoff, Quade and Douglas 2001A). States with joint power authorities, like California and Minnesota, are in position to enact laws that allow binding agreements between transit agencies and localities to coordinate development. An example is the Capital-Area Development

Approaches to Transit Joint Development

In a seminal article on transit joint development, Sedway Cooke (1984) identified three generic approaches to implementation: (1) *the laissez-faire market approach*, mainly involving the private sector taking the lead with an eye toward maximizing profits; BART's Walnut Creek station was cited as an example; (2) a *coordinated approach*, involving the public sector establishing a comprehensive land use plan prior to station construction that orchestrates private- and public-sector activities; early joint development activities in Washington, D.C. and Atlanta were said to follow this approach; and (2) *project packaging*, wherein the transit agency is more entrepreneurial, seeking to recapture value, temper land speculation, and become an active participant in land development; today, Washington's WMATA comes the closest to this proactive model.

In a more recent assessment, Bernick and Freilich (1998) have outlined various tools available to transit agencies to leverage TOD and TJD: (1) the use of transit district-owned land for development; (2) the assembly of land for development; (3) infrastructure investment (directly or through tax increment financing); (4) parking development and utilization of shared-use parking; (5) the underwriting of land costs; (6) the direct financial participation (issuance of tax exempt bonds, low interest loans, loan guarantees, grants, equity participation); (7) expediting the entitlement approval process; (8) the provision of station area benefits in exchange for land or other private-sector contributions; (9) locating public facilities within transit-based developments to spur economic activity; and (10) the utilization of flexible development approaches (design-build/turnkey) and creation of public/private subsidiaries.

Authority (CADA), formed through a joint powers agreement between the state of California and the city of Sacramento to administer a plan for residential and state office development in a 40-block, LRT-served area around the state capitol.

The role of transit agencies in promoting TOD and TJD raises fundamental questions regarding *legitimacy* and *mission*. Not all transit board members believe land development issues fall within the purview of transit agencies, preferring to define their missions more narrowly. Some agencies have been so consumed with everyday and pressing matters, such as securing full-funding agreements for their long-range investment programs, that joint development has fallen way down the list of priorities. And some agencies have adopted firm replacement parking policies, all but precluding the joint development possibilities in instances where land prices are high.

An early review of transit joint development identified three main obstacles in the minds of some elected officials: (1) doubts about the profitability of TJD (given the transaction costs that would be incurred) and when financial returns will accrue; (2) shortages of qualified staff members who can package TJD deals and produce financial *pro formas*; and (3) an absence of station-area master plans that can orchestrate the design and execution of individual TJD projects (Keefer 1984).

The spectrum of participatory roles transit agencies can take on are wide-ranging—from as modest as providing technical information (e.g., transit-supportive design guidelines) to as ambitious as being the self-anointed lead developer. The following sections outline various agency levels of involvement in leveraging TOD and TJD to date.

Proactivism

Some U.S. transit agencies have been out-front, aggressively seeking to influence land development around their transit facilities. San Diego's Metropolitan Transit Development Board (MTDB), for example, has participated directly in some commercial real estate projects, like the landmark MTS/James R. Mills Building,[3] while also influencing projects it does not own that are adjacent to Trolley stations and major bus corridors. The board has accomplished the latter through public education and outreach efforts that support TOD (e.g., the preparation of transit-supportive design guidelines and the release of promotional videos on neo-traditional, transit-friendly designs (Dunphy 1995; Bragado 1999). Complementing the MTDB's initiatives have been a series of pro-TOD programs launched at the municipal level (e.g., safe-street design guidelines, TOD overlay zoning, new street design standards, flexible parking standards) and regional level (e.g., San Diego Association of Governments strategy of promoting growth in "rail transit focus areas" as part of a regional growth management plan).

Just to the north in greater Los Angeles, there has long been institutional support for TJD, beginning with the formation and staffing of a joint development office several decades ago under the predecessor to Metropolitan Transit Authority (MTA), the Southern California Rapid Transit District (SCRTD) (Howard et al. 1985). In recent times, MTA has taken the lead in preparing station-area master plans in close concert with local governments. The

[3] This was a product of San Diego's Metropolitan Transit Development Board (MTDB) co-venturing with the Starboard Development Corporation on the 10-story air rights office building at the Imperial and 12th Street Trolley transfer station. MTDB provided the land and transit infrastructure, and Starboard financed the building construction under a cost-sharing agreement.

agency has also found that opportunities exist for telecommunication or telecommuting facilities that can capitalize on the agency's ownership of right-of-ways (Gilson and Francis 1993). Additionally, MTA has been mindful that it should not preclude TJD when opportunities avail themselves. For example, the agency has adopted a policy of constructing knockout panels in its stations that allow local businesses, at their cost, to tunnel to the station entrance or provide permanent access in exchange for construction rights and permanent easements.

In Southern California, transit agencies have also turned to alternative development approaches to spread risks and economize on projects, including partnering, turnkey, and design/build. For example, insurance and performance bonding are typically less expensive for public agencies than for all but the largest construction companies; public-private partnerships can thus lower these costs (despite governments having to absorb more risks). Los Angeles's MTA entered into a design-build turnkey arrangement with Catellus Development Corporation to construct the MTA headquarters project at Union Station.[4] Another model is to establish a separate joint development subsidiary outside a transit agency (Sedway Kotin Mouchly Group 1996). San Diego has adopted such a redevelopment structure wherein the city council (operating as the redevelopment agency) established the Centre City Development Corporation (CCDC) as the operating arm for land-use matters.

This partnership approach is recommended by White and McDaniel (1999), who call for transit agencies to enter into cooperative (CO-OP) agreements for TJD projects. The idea is to combine the strengths of multiple governmental entities under a single operating umbrella. The key activities that might be consolidated from multiple agencies under a CO-OP agreement include

- Site assemblage;
- Flexibility (or relaxation) of zoning;
- Zoning incentives;
- Low-cost financing (through tax-exempt financing, sale-leaseback, lease or loan guarantees, federal grants);
- Provision of infrastructure;
- Improved coordination between governmental entities;
- Expedited processing;
- Land-use coordination; and
- Establishment or creation of a growth center and, to an extent, a captive market of transit riders.

As reviewed in the closing section of this chapter, the transit authority in metropolitan Washington, D.C., has aggressively pursued TJD as much as any transit agency in the country. As in the case of Southern California, TJD only occurred as a result of board members buying into the notion, early on, that transit agencies are not just about running trains and buses—they are also in the business of creating markets that will fill those trains and buses, largely through cutting deals with private developers to build trip-generators near train stops.

Coordination and Facilitation

More common than the Southern California and metropolitan Washington models of proactivism is the role of the transit agency as facilitator and coordinator. Greater Portland's Tri-County Metropolitan Transportation Authority (Tri-Met) is a case in point. Tri-Met views itself as a coordinator, not as a

[4] The entity formed, called Union Station Gateway, Inc. (USG), was a nonprofit business corporation under California law, wherein the Board of Directors (drawn from both MTA and Catellus) acted as design-builder, conducting all business required of a design-builder under a traditional private-sector agreement.

developer. In the words of a Tri-Met project manager, the agency is in the "bus and trains business, not the development business" (Lefaver 1997, p. 169). Tri-Met has instead opted to focus on encouraging development within a five-minute walk of its primary transportation network through the development of station area development profiles, which identify sites suitable for development, such as vacant land, under-utilized surface parking lots, and land valued below ten cents per acre. To date, Tri-Met has contributed land to developers at no cost in exchange for non-conventional development standards. The agency has also prepared real estate *pro formas* and cost estimates to facilitate development. In the case of Gresham, at the terminus of the east-side line, Tri-Met was helped in writing development agreements, consolidating easements, and coordinating planning activities with other public agencies.

Some transit agencies have provided incentives in hopes of stimulating TOD. In King County, Washington, the department of transportation offered the city of Bellevue an increase of 10,000 bus hours over a 2-year period if employment could be increased in their downtown area and if these new developments could be built with reduced parking requirements (Cervero 1989; White and McDaniel 1999).

Other transit agencies have focused on design standards as the preferred approach toward encouraging TOD. Sacramento's Regional Transit District (SRTD) has incorporated TOD design standards into its transit master plan, and is one of the few transit agencies surveyed out of 300 by White and McDaniel (1999) that has used modified street standards in its TOD policies. SRTD's master plan states that streets in new developments should be designed for ease of pedestrian circulation. The plan discourages dead-end streets, cul-de-sacs, "loops-and-lollipops," and oversized blocks, and encourages grid street patterns and unobstructed through streets (White and McDaniel 1999).

A growing legion of bus-only transit systems is also committed to transit-supportive development. The transit agency in Bridgeport, Connecticut, has a history of seeing itself not only as a provider of transit services, but also as a catalyst for economic and community development. The agency has long been involved in a wide variety of non-traditional transit activities, including the solicitation of public input into service design, the organization of street festivals that promote transit riding, and the development of joint advertising campaigns with local businesses. By strengthening the fabric of the communities that the transit district serves, officials hope to attract more private investment, spur economic revitalization, and increase patronage (Greater Bridgeport Transit District 1985).

Inactivity

For most small transit agencies and quite a few medium-size ones, TOD and TJD are off the radar screen. From a national survey of approximately 300 transit agencies, White and McDaniel (1999) found that only a handful were actually involved in TOD or TJD projects. Very few had full-time staffers devoted to TOD or TJD. In most of these instances, board members felt that such matters were outside the purview of a transit operator.

II.6 Development Commitments and Policies within Transit Agencies

Among the relatively few U.S. transit agencies actively pursuing TOD and TJD, the presence of an in-house joint development office that participates in soliciting and advancing projects forward is crucial in their success (Cervero et al. 1991; White and McDaniel 1999). Transit agencies like the Washington Metropolitan Transportation Authority (WMATA), Miami's MDTA , San Francisco's BART, MARTA in Atlanta, San Diego's MTDB, and the Los Angeles MTA have a strong track record of supporting TJD. All have in-house joint development and real estate offices. In the case of Miami, TJD has become the purview of county government, which oversees the MDTA and controls land uses along most rail-served corridors. The county also created the Office of Leasing with five staff positions to manage and market TJD projects (Price Waterhouse LLP 1998).

In a recent survey of transit agencies that received federal New Starts funding, Deakin et al. (2002) found growing interest among large transit agencies to develop in-house expertise in land-use planning, real estate law, project finance, and public outreach to facilitate TJD and TOD projects.

Often, development-minded transit agencies assigned staff members to work directly with local governments and the private sector. In some instances, real estate advisory committees have been formed to supplement

A Learning Curve

In Miami's Dade County, the Dadeland North and Dadeland South stations along the Dixie Highway corridor have evolved into mixed-use urban centers as a result of TJD agreements entered into by the transit agency (the Metropolitan Dade Transit Authority, or MDTA) and private developers. The history of these projects and the contractual agreements that shaped their fortunes also reveal the learning process that MDTA has gone through and how they have taken lessons learned from early TJD projects and applied those lessons to shaping future contractual agreements. At Dadeland South – the first TJD agreement undertaken by the MDTA – the contract contained no penalties to the developer for finishing late. The slowness of phase completion translated into lost income to MDTA. As a result, in 1994 the developer signed a contract for a 99-year land lease. The phases of the project must be completed within a pre-specified timeframe, or a penalty kicks in. At Dadeland North, if any phase is delayed, a developer must pay $20,833 per month (in 1994 currency), indexed to inflation. Furthermore, the lease terms provide MDTA with security against the development's failure and a cut of the profits if it is successful, stating that the MDTA receives the greater of a minimum rent or a percentage of gross profits.

Further problems that were encountered in the Dadeland South experience were corrected at Dadeland North. At Dadeland South, the developer sold the development rights to a third party and made a profit. The MDTA did not participate in any of this profit. The Dadeland North contract specified that MDTA will receive 5 percent of any such future sales (Price Waterhouse LLP 1998).

the sometimes limited experience of public-sector staffers in executing real estate projects (Lefaver 1997). Because the pay scales of transit agencies fall considerably below those of most private real estate firms, it is widely accepted that transit agencies will never possess the degree of in-house expertise that their private-sector counterparts have.

Nowhere has there been a stronger in-house commitment to TJD to date than within the Washington Metropolitan Area Transit Authority (WMATA). Key to success was the formation, early on, of a real estate division within the transit agency. With financial and institutional support provided by board members, WMATA's real estate office has over time amassed an impressive portfolio of land holdings, much of it purchased on the open marketplace. WMATA generally executes long-term, unsubordinated ground leases with private developers and in a few cases has made fee simple sales. Ground leases not only provide for a base rent but also for a percentage rent that affords the agency an opportunity to participate in the success of a TJD project (McNeal and Doggett 1999).[5]

WMATA's TJD projects run the gamut, from revenue-producing schemes (e.g., air rights leasing, station-retail connections) to cost-sharing arrangements (e.g., shared use of heating systems, construction-cost co-venturing). An early study of WMATA's TJD program found it to be highly remunerative, with a benefit-cost ratio (based on value capture to agency expenditures) of 8 to 1 (Keefer 1984). Rather than waiting and reacting to developer proposals, WMATA's real estate office aggressively seeks out mutually advantageous TJD opportunities. As of 2000, WMATA had undertaken 27 development projects at a value of more than $2 billion on land they own.[6] Most recently, the agency has exploited FTA's new joint development rulings. The new guidelines require a transit agency to maintain "sufficient continuing control over the property to ensure its continued physical or functional relationship to transit."[7] However, this control can be achieved in many indirect ways, such as through an easement. Several years ago, WMATA sold a parcel it owned next to the Grosvenor station for a large-scale housing project, maintaining an easement for transit use. Because it controlled access, the FTA's new joint development rulings allowed WMATA to retain all proceeds from the land sale.

The sell-off and adaptive reuse of surface parking lots is widely viewed as a new frontier for TJD, also made possible by FTA's more permissive common-grant rules regarding joint development projects. Under the auspices of Maryland's "smart growth" initiatives, efforts are currently underway to fill in current parking lots in Owings Mills, currently the terminus of Baltimore's northwest light rail line (see box below). Notwithstanding such inroads, parking has long been a quagmire in the TJD arena. Parking can be a deal-maker or deal-breaker. Shared-parking arrangements provide a

[5] WMATA has developed the following criteria for evaluating developer proposals: (1) the financial viability of the project; (2) the effects on ridership; and (3) the amount of revenue projected. In 1998, the agency received almost $6 million in TJD revenue. Downtown and suburban developments average 60 percent and 35 percent transit mode shares, respectively. Research shows that a 20,000 sq. ft. downtown office building generates 300,000 trips annually, and $500,000 in revenue to WMATA (Price Waterhouse LLP 1998).

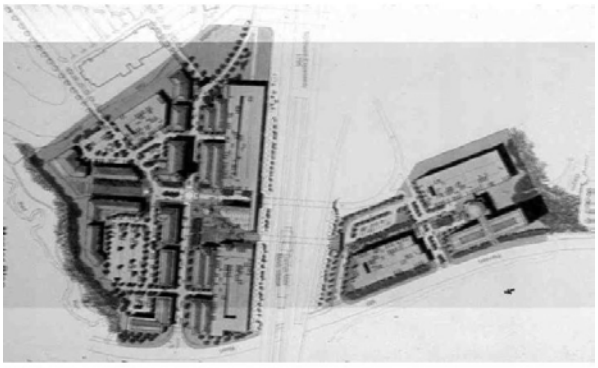
[6] These undertakings produce more than $6 million annually in additional funds to the Metro system. The amount is forecast to grow to $15 million annually by 2015. In the past year, WMATA has realized a 50 percent price premium (over appraised value) on land sales. The premium in land sales to WMATA exceeds $50 million (Parsons, Brinckerhoff, Quade and Douglas 2001A).

[7] 62 Fed. Re. 12, 266 (1997), at 12267.

From Parking Lot to Town Center

In Owings Mills, Maryland, efforts are underway to reuse station-area parking, spurred by Governor Glendening's commitment to smart growth. Currently, some 4,000 commuters drop their cars off at the Owings Mills light rail station each weekday and board trains in the direction of downtown Baltimore. Local planners hope to transform the station area from a car drop-off point to a vibrant urban center. In the minds of many, the parking lot represents an under-exploited asset – real estate with exceptional regional access. Plans call for transforming the 44-acre site split by Interstate-795 to a mixed-use urban village featuring professional offices, retail shops, a hotel, housing, and civic facilities. Existing surface parking will be replaced by parking structures aligned along the freeway that also serve the purpose of buffering the mixed-use village from traffic noise. While the community of Owings Mills has all the features of an edge city, including a regional mall and some 2.5 million square feet of office space, it lacks a focal point. Proponents hope that a European-style transit village will finally provide one.

Current Surface Parking Lot



Plan Representation of Infill Development

Source: LDR International, an HNTB Company, Columbia, Maryland, 1999.

natural context of TJD, but hyper-sensitivity to adequate parking supplies among both public and private interests, and unwillingness of city planners to bend standard parking codes, often stands in the way. While surface parking represent a form of land-banking for future infill development in the minds of some, they represent guarantees of easy park-and-ride access in the minds of others. Once established, station-area parking can be difficult to eliminate or even scale back. In the San Francisco Bay Area, BART's requirement that there be 1-to-1 replacement for any parking spaces removed has hampered joint development prospects. In the case of San Francisco's 3rd Street light rail project, the municipal transit operator, MUNI, worked closely with local residents and businesses to develop parking recommendations that increased on-street parking and shared parking opportunities, preserved short-term parking through metering, and increased awareness of parking options with improved signage (City of Seattle 1999).

Parking lot conversions sometimes occur when rail lines are extended, transforming a terminal station to an intermediate one (e.g.,

Ballston on Washington Metrorail's Orange Line). Having ample parking is particularly important for terminal stations because they serve large catchments. Without sufficient supplies of parking, many more commuters would opt to drive than to take transit. In some places, it may be desirable to increase parking supplies to serve commercial development as well as commuters in and around transit stations.

In close, past research suggests that TOD and TJD require a proactive public sector, one that (1) takes the lead in preparing specific plans that win the consent of neighborhood and community groups, (2) banks and assembles parcels into developable plots, (3) writes down the cost of land in return for participation in project revenue, (4) provides the infrastructure necessary for new development (either through direct investment or mechanisms like tax-increment financing), (5) creates development incentives such as density bonuses, and (6) underwrites early phases of housing and retail development to generate private-sector interest in later phases (Urban Land Institute 1979; Rice Center 1979; Cervero et al. 1991). The transit agency can often be a key player, in part because it owns much of the land around stations. Moreover, timing is crucial. The private sector needs to be brought into the development process early, along with neighborhood groups.

Parking or TOD?

Is the land around transit stations best used for commuter parking or building communities? That question is a source of tension facing transit systems across the county. The long-term goal of 'community building' and the essential short-term goal of maximizing ridership are often put in conflict with each other (Parsons, Brinckerhoff, Quade and Douglas 2001A). The compromise offered by many transit managers is to use commuter parking as land for development. In theory, as the TOD development market matures, the parking lots can be harvested as land for TODs. In reality, however, the theory has rarely worked due to the difficulty of taking parking back from existing park and ride patrons (who often view the parking as their vested right). Indeed, the collective voice of existing park-and-ride lot patrons is always louder than the voice of future residents. (For an example of a TOD created from a park-and-ride lot, see the Ohlone-Chynoweth profile in Chapter 5 "What is the Status of TOD in California").

Accommodating commuter parking demand often results in a transit station platform surrounded by a sea of parking. This has limited opportunities for TOD in several ways. First, the parking separates the transit system from the adjacent community along with potential TOD parcels. Second, the parking creates an automobile-oriented environment, rather than the pedestrian environment that is essential for transit-oriented development. Third, the need for significant parking leads to siting stations in locations that are not conducive to TOD. Finally, regulatory requirements for replacement parking severely limit the possibility of converting commuter parking into TODs.

Washington, D.C.'s Metrorail, Maryland's Transit Authority, and San Francisco's BART are fairly typical of the dilemma TOD planners face. The primary function of many of their suburban stations is to provide commuter parking. Under their procedures, surface parking can only be used for TOD if commuter parking is replaced on a "1-to-1" basis.

The cost of replacing parking spaces becomes a TOD requirement, not a transit system requirement. In other words, the TOD must develop enough revenue to replace surface parking for transit commuters with structured parking. In these instances, replacement parking requirements have placed a higher value on the short-term ridership generated from park-and-ride than the long-term benefits that are realized through creating communities around transit stations. Unfortunately, the concept of generating riders from TOD, thereby reducing the need for replacement parking, is currently not an option in many areas of the United States. This is a common situation in lower-density, sunbelt rail cities like Dallas.

Dallas is now confronting this very issue at Mockingbird station. The developer of an adjacent mixed-use TOD has inquired about the possibility of relocating parking in front of the station and developing the vacated land as apartments. So far, the Dallas Area Regional Transit (DART) system has resisted. Even with "1-to-1" replacement parking, DART appears to be more interested in preserving the land in front of the station as parking. For many local decision-makers and their constituents, parking is seen as a more important transit use next to the platform than a TOD.

Similarly, in Denver, local TOD planners are concerned that the Regional Transportation District (RTD) is placing too much emphasis on meeting the demand for parking with its new I-25 corridor light rail line. A widespread belief that there was too little parking at transit stations on their newly opened Southwest Corridor is behind this pro-parking stance.

In contrast, the original design of both of Portland's light rail lines allocated fewer parking spaces than what projected demand called for. Additionally, walk and feeder bus routes were given preference as modes of access to the stations. Indeed, with just two exceptions, parking does not act as a barrier separating the stations from the community. Specifically, on the Westside line, Portland's transit agency, Tri-Met, agreed to the redesign of parking away from the platform at four stations (Hillsboro Government Center, Orenco, 185th and Beaverton Creek) to maximize the opportunity for TOD.

III. EVALUATION OF IMPACTS AND BENEFITS

Evaluations of the impacts of TOD and TJD fall into two main categories: (1) impacts of public policies; and (2) impacts on public and private outcomes. The former traces how inputs (e.g., legislation and grants) have been translated into outputs (e.g., TODs). The latter traces the degree to which outputs (e.g., TJD projects) have yielded hoped-for benefits to both the public (e.g., increased patronage) and private (e.g., rent premiums) sectors.

The potential impacts of TOD and TJD are far-reaching. Among the objectives embraced by TOD initiatives are neighborhood revitalization, improved transportation conditions, and enhancement of built and natural environments (Table 1). One recent study listed 10 possible benefits of TOD (see page 28) (Arrington and Parker 2001).

Table 1. Public Benefits Associated with TOD and TJD: Benefits to Governments Versus Communities At-Large

Governments: Transit Agencies/Municipalities	Communities At-Large
Increased ridership	Spur neighborhood redevelopment
Increased revenues from joint development and co-development	Improve local traffic conditions
Value capture—increased property tax proceeds; land development profits	Promote compact, mixed-use urban forms that preserve open space
Strengthen institutional relationships	Spurs economic development, including job growth

Experiences show that, under the right conditions, high-quality transit can be a boon to local communities, especially when coupled with proactive public assistance and involvement: it can spur the redevelopment of declining neighborhoods (e.g., downtown Long Beach, California), spawn new suburban villages (e.g., Pleasant Hill, California), breath life into older suburban downtowns (e.g., Bethesda, Maryland), and speed up the transition of places suffering slow commercial encroachment (e.g., Ballston, Virginia). Importantly, TODs can contribute toward creating a more sustainable built form, functioning as a counter-magnet to auto-induced sprawl.

While the chief environmental benefit of TOD comes from coaxing motorists over to mass transit, a secondary benefit is the inducement of more walk and bicycle access trips to and from transit (see page 29). Larger shares of rail trips accessed by walk-and-ride and bike-and-ride can reduce the need for parking and improve air quality. All transit trips involve some degree of walking, but recent research (Cervero 2001) makes clear that attending to the mobility and design needs to those who exclusively walk to and from stations is especially important.

Capitalizing on the potential community benefits conferred by TOD and TJD projects can be an uphill struggle in inner-city areas. Research shows that even in good economic times, the mere presence of transit cannot, by itself, catalyze a miraculous transformation of depressed inner-city neighborhoods (Boarnet and Crane 1998B; Loukaitou-Sideris and Banerjee 2000). A Delphi panel study of professionals involved with TOD underscored the particular difficulties of bringing projects to fruition in inner-city settings. Major barriers include high financial risks, negative images, fear for safety, class

What are the Benefits of TOD?

A recent study, *Factors for Success in California's Transit-Oriented Development*, commissioned by the California Department of Transportation, identified the following 10 potential benefits of TOD. The study cites research showing that TOD can:

1. **Provide mobility choices**. By creating "activity nodes" linked by transit, TOD provides important mobility options, very much needed in congested metropolitan areas. This also allows young people, the elderly, people who prefer not to drive, and those who don't own cars the ability to get around.

2. **Increase public safety.** By creating active places that are busy through the day and evening and providing "eyes on the street," TOD helps increase safety for pedestrians, transit-users, and many others.

3. **Increase transit ridership.** TOD improves the efficiency and effectiveness of transit service investments by increasing the use of transit near stations by 20 to 40 percent, and up to five percent overall at the regional level.

4. **Reduce rates of vehicle miles traveled (VMT).** Vehicle travel in California has increased faster than the state's population for years. TOD can lower annual household rates of driving 20–40 percent for those living, working, and/or shopping within transit station areas.

5. **Increase households' disposable income.** Housing and transportation are the first and second largest household expenses, respectively. TOD can free-up disposable income by reducing the need for more than one car and reducing driving costs, saving $3000-$4000 per year.

6. **Reduce air pollution and energy consumption rates.** By providing safe and easy pedestrian access to transit, TOD allows households to lower rates of air pollution and energy consumption. Also, TODs can help households reduce rates of greenhouse gas emissions by 2.5 to 3.7 tons per year.

7. **Conserve resource lands and open space.** Because TOD consumes less land than low-density, auto-oriented growth, it reduces the need to convert farmland and open spaces to development.

8. **Play a role in economic development**. TOD is increasingly used as a tool to revitalize aging downtowns and declining urban neighborhoods, and to enhance tax revenues for local jurisdictions.

9. **Contribute to more affordable housing.** TOD can add to the supply of affordable housing. It was recently estimated that housing costs for land and structures can be significantly reduced through more compact growth patterns.

10. **Decrease local infrastructure costs.** TOD can reduce costs for water, sewage, and roads to local governments and property owners by up to 25 percent.

Source: Arrington and Parker (2001)

From Park-and-Ride to Walk-and-Ride

Studies in greater Washington, D.C., metropolitan Toronto, and the San Francisco Bay Area show that beyond one mile of a suburban rail station, around 60 to 80 percent of access trips are by automobile, with the share rising steadily as access distance increases (Stringham 1982; JHK and Associates 1987, 1989; Cervero 1994C). Getting more rail transit users to walk-and-ride, bike-and-ride, or bus-and-ride rather than park-and-ride can yield a number of benefits (Cervero 2001). By reducing the need for parking lots, rail transit agencies can redirect investments and resources to improved mainline services. Less surface parking also reduces the separation of land uses, effectively "de-scaling" suburban landscapes, freeing up land for infill development. And encouraging non-motorized forms of station access can yield transportation and environmental benefits by reducing vehicle-miles-traveled (and thus greenhouse gas emissions and energy consumption) as well as the traffic snarls and noise levels that often afflict neighborhoods located near rail stations. Research has shown that the disadvantage of living near a park-and-ride lot can lower residential property values, all else being equal. In the case of the Santa Clara Light Rail Transit system, Landis et al. (1994, p. 28) found single-family homes within 800 feet of a light rail station with a parking lot were worth around $31,000 less than equivalent properties beyond the immediate impact zone of a station, controlling for other factors. Perhaps the biggest environmental benefit from converting larger shares of rail access trips from park-and-ride to walk-and-ride and other means is less air pollution. From an air quality standpoint, transit riding does little good if most people use their cars to reach stations. For a three-mile automobile trip, the typical distance driven to access a suburban park-and-ride lot in the United States (Cervero 1995), 84 percent of hydrocarbon (HC) emissions and 54 percent of nitrogen oxide (NO_X) emissions are due to cold starts (inefficient cold engines and catalytic converters during the first few minutes of driving) and hot evaporative soaks (Barry and Associates 1991). That is, a sizeable share of tailpipe emissions of the two main precursors to the formation of photochemical smog occur from turning the automobile engine on and driving a mile and turning it off. Drive-alone access trips to rail stations, regardless how short they are, emit levels of pollutants that are not too much below those of the typical 10-mile solo commute. Thus, relying on a car to access a metropolitan rail service can negate the air quality benefits of patronizing transit.

Transforming Urban Spaces. Studies reveal that the decision to walk or not is strongly influenced by quality of walking environment (Untermann 1984). Computer-generated visual simulations can be used to show how, through a generous amount of landscaping, a typical suburban strip can be transformed into a much more appealing environment. (Photo: Beyard and Pawlukiewicz, 2001)

and racial prejudices, and sometimes concern among residents themselves that neighborhoods will be gentrified (Loukaitou-Sideris 2000).

III.1 Effects of Federal Policies and Programs

In recent years, a number of grant programs and policy initiatives have been introduced, at all levels of government, which promote TOD and TJD. The literature mainly traces how these initiatives have spurred TOD and TJD themselves—that is, their effects on outputs, not outcomes. Besides the two watershed acts of the 1990s, the Intermodal Surface Transportation Efficiency Act of 1991 (ISTEA) and TEA-21,[8] which encouraged a more flexible and balanced approach to transportation planning and investment, important national policies and programs that have promoted TOD and TJD include:

- *New Joint Development Policy:* FTA's 1997 reinterpretation of the Federal Common Grant Rule set the stage for a fresh, new approach to transit joint development. New FTA guidelines, among other things, permits transit agencies to sell land holdings financed by federal grants without having to return proceeds as long as the grantee retains control over TJD projects and funds are used to "help shape the community that is being served by the transit system." In the past, transit agencies that sold off parking lots and other ancillary land to private developers had to return the proceeds to the U.S. Treasury. The new ruling encourages "transit systems to undertake transit-oriented joint development projects" in conjunction with their transit systems "either under new grants or with property acquired under previous grants." This revision also allows transit agencies to make sales to developers based not on the highest revenue returns but on the agency's assessment of which development proposal will develop the site in its "highest and best transit use." Therefore, transit agencies may select the development proposal that offers the highest payback in terms of potential ridership or some other benefit rather than the highest bid offered for the property itself (Bernick and Freilich 1998, p. 8).

  To date, transit properties in Washington, D.C., Atlanta, Portland, Southern California, and the San Francisco Bay Area, among others, have been particularly aggressive in exploiting this new ruling.[9] The BellSouth multi-tower complex, currently under construction at MARTA's Lindberg Station in the fashionable Buckhead district of Atlanta, took advantage of the new rulings to expedite the construction of a massive 4.9 million square-foot mixed-use project that includes BellSouth headquarters, adjoining office towers, a 300-room hotel, a cinema, retail shops, and housing.

- *Livable Communities*: Grant programs like the Livable Communities Initiatives, launched in 1994 by FTA, aim to empower inner-city neighborhoods across the United States by making them eligible for special grants and tax credits. Assistance has gone to siting child-care centers and police substations near transit stations and improving access

[8] Among the grant programs under TEA-21 that support TOD and TJD are Transit Enhancements (that provides funding for preservation, public amenities, and beautification projects), Transportation and Community Preservation, and Congestion Management and Air Quality (CMAQ) Improvements.

[9] In the past, transit agencies have made available property for housing projects under long-term ground leases, such as the 47th Street station in San Diego and the Willow Street commercial project in Long Beach. Lenders prefer a fee-simple structure that requires sale of land. The new FTA guidelines allow this.

to rail stops in Cleveland, St. Louis, Baltimore, Philadelphia, Oakland, and other U.S. cities.[10]

- *Transportation and Community and System Preservation Pilot Program (TCSP).* This program provides grants to local communities and transit agencies for integrating transportation and land use. Grants are given to state, local, and regional agencies that partner with community groups, non-profit organizations, or private investors to enhance transportation and land-use connections. The competitive grant process gives priority to teams that are pursuing innovative approaches to transportation problems by investigating the relationships between transportation and community, exploring system preservation practices, and developing private-sector-based initiatives to support TCSP goals (Lefaver et al. 2001). TCSP grants are awarded to communities to (1) encourage transportation efficiency; (2) reduce negative effects of transportation on the environment; (3) improve access to jobs, services, and trade centers; (4) reduce the need for costly future infrastructure; and (5) revitalize underdeveloped and brownfield sites. The grants can also be used to study urban development patterns and to create strategies that encourage private companies to work toward these goals in designing new developments. One recent recipient was New Jersey Transit, which was awarded an $810,000 TCSP grant to assist 11 municipalities in developing strategies to enhance connections between station areas and surrounding communities and leverage private capital to redevelop station areas (New Jersey Transit 2002).

  Since the passage of TEA-21, more than $53 million in TCSP grants have been made across the country. TCSP funds are being used to explore TOD possibilities for a proposed new rail line in Philadelphia and for a commuter rail corridor between Atlanta and Athens, Georgia. The city of San Francisco formed a TOD branch in its planning department and promptly received a TCSP grant to prepare a transit-oriented land-use plan for the Balboa Park Station in the Mission Street Transit Corridor. This experience is now being used as a model for other TODs throughout the city.

- *New Starts Criteria*: FTA's Section 5309 New Starts Criteria weigh local commitment to transit-supportive land-use planning in granting discretionary funds for new rail investments.[11] The guidelines identify "transit-supportive existing land-use policies and future patterns" as a key criterion—defining this criterion as "supportive zoning regulations near transit stations," "tools to implement land-use policies," and "the performance of land-use policies." San Juan's Tren Urbano rail project received the green light to move forward in part because of a strong local

[10] The fusion of TOD and community rebuilding can be found in such Livable Communities projects as Baltimore's Reistertown Metro Station, which added a child-care center on an underutilized parking lot; construction of new housing, retail shops, and pedestrian walkways near the 35th Street Station of Chicago's Green Line; and the rehabilitation of the Windemere Station in East Cleveland to incorporate a Head Start Educational Facility.

[11] 49 U.S.C. § 5309(a)(5); Federal Transit Administration, *Technical Guidance on Section 5309 New Starts Criteria*, Washington, D.C., 1999. In December, 2000, FTA issued regulations affecting fixed guideway transit projects that are proposed for funding under the Section 5309 New Starts program. The final rule sets forth procedural requirements for planning and project development, and defines the New Starts Criteria that FTA will use to evaluate projects for funding. The rule went into effect in February 2001, although some of the criteria do not become effective until September 2001. All of the criteria will apply to the FY 2003 New Starts ratings process.

commitment to TOD and TJD along the "miracle mile" office-retail corridor of Hato Rey. Portland's Westside Light Rail project includes a special appendix to its 1995 Full Funding Grant Agreement that links federal funding for the project to implementing transit-supportive land-use actions (Arrington 2000).

Survey work by Parsons, Brinckerhoff, Quade and Douglas (2001A) suggests land-use matters are being taken more seriously by transit properties across the United States, especially among agencies planning new extensions (relative to those starting from scratch). Similarly, Deakin et al. (2002) found that many transit agencies that are planning or constructing New Starts are actively seeking transit-supportive land uses around stations. Many have given priority to route alignments and station locations in jurisdictions that have adopted transit-supportive land-use plans or areas with preexisting transit-supportive land-use patterns. While nearly three-quarters of the 21 agencies interviewed in this study reported actively working with local governments in transit-supportive land-use plans, around half reported that they were seeking changes in local governments' land-use plans to make them more transit supportive.[12] Some transit agencies such as Hampton Roads Transit, the Central Puget Sound Regional Transit Authority, and Capital Metro are actively pursuing appropriate land-use plans for corridors slated for major transit investments.

Other federal initiatives that potentially support TOD and TJD, to varying degrees, include the Urban Initiatives Program of the Urban Mass Transit Administration (UMTA), authorized by the Surface Transportation Assistance Act of 1978 (and discontinued three years later), which gave federal grants for the acquisition of land that was physically or functionally related to transit facilities for joint development (Weiner 1997); Location Efficient Mortgage (LEM) programs, jointly sponsored by Fannie Mae and several private banks, that make it easier to purchase a home near transit stations (under the premise that lower transportation costs free up earnings for housing consumption); the Environmental Protection Agency's "Brownfields" program for clean-up of urban sites; and housing subsidy programs under the U.S. Department of Housing and Urban Development (HUD), which promote coordination between transit and housing. Congestion Management/Air Quality (CMAQ) funds (designed to help local governments implement the federal Clear Air Act Amendments of 1990) can also support TOD planning and projects, though in practice these funds have gone to capital projects. CMAQ funds were recently used to fund TOD activities, including land acquisition, on the Hiawatha corridor in Minneapolis. The regional planning organization had to demonstrate that TOD holds promise for enhancing air quality by diverting car trips to transit.

To date, little formal evaluation of the impacts of federal initiatives on the practice of TOD and TJD has been carried out. While grants and other promotional efforts have likely had favorable impacts, the magnitude and scope of these impacts remain largely unknown. What is currently known about the impacts of federal policies on either outcomes or outputs mainly takes the form of anecdotes and case descriptions. No statistical analyses or quantitative assessments could be found in the literature.

[12] While this survey found that the New Starts criteria are influencing the choice of transit alignments, most responding transit agencies reported that they balance these criteria against local objectives such as fair-share distribution of resources, social equity, and economic development considerations. New Starts criteria are being used more as guidelines than as hard-and-fast rules.

III.2 Effects of State Policies and Programs

Complementing federal initiatives have been recent smart-growth and transit village initiatives spearheaded at the state level. Planning Act AB 3152, for example, allows California's transit village development local governments to adopt transit village development plans, similar to general plans, and apply various tools in promoting TOD, including density bonuses, increased access to transportation funding sources from the state, assistance in establishing expedited permitting processes, and exemption from roadway minimum level of service requirements for developments in proximity to regional routes of significance (Bernick and Freilich 1998; Cervero 1998B). New Jersey also recently introduced a transit village program. This program is a cooperative effort of NJ Transit and several state agencies, including the department of transportation, the economic development authority, the department of community affairs, the office of planning, the redevelopment authority, and the housing and mortgage finance agency. To date, the program has provided technical assistance to five communities to facilitate transit station redevelopment efforts. The program also provides prioritized consideration to the selected communities for allocation of grant monies from existing state programs (Isaacs 2002).

California's Transit Village Act

California's Assembly Bill 3152, passed in 1994, promotes the adoption of transit village plans that may include the following: neighborhood developments centered near transit stations that attract those who may patronize transit; mixes of housing types that include apartments within a quarter mile of transit stations; mixes of land uses that provide retail sites oriented to the transit station and civic uses, including day care centers and libraries; and improvements that encourage pedestrian and bicycle access. The act further stipulates that no public work projects, tentative subdivision maps, or parcel maps may be approved, nor zoning ordinances adopted or amended, within an area covered by a transit village plan unless the map, project, or ordinance is consistent with the adopted transit village plan. In its original incarnation, the act called for the extension of California's fairly liberal redevelopment powers, including the ability to use tax increment financing, to transit station areas even if they do not meet statutory thresholds set for "physical or economic blight." Stiff political opposition resulted in such provisions being stripped from the final bill. Without a designated pot of funds set aside for TOD, California's Transit Village Act has been fairly ineffective. A 1998 survey failed to uncover any examples where local stakeholders felt the act had a meaningful influence on decisions to pursue TOD (Cervero 1998B). Indeed, a majority of local planners who were interviewed for the study were not even aware of the act's existence. The automatic exemption of conforming projects within a transit village district from traffic impact assessments under the state's Congestion Management Act was considered by interviewees to be the act's most attractive provision. Evidently, this provision is not attractive enough to spur local planning given the lukewarm public-agency response to the act. Until the California state legislature and governor's office back the act with substantial funding support, most observers feel the act will continue to languish in obscurity.

Not all state programs governing transit have worked in favor of TOD and TJD. As creatures of state law, transit agencies are often heavily regulated. Sometimes transit agencies are legally hamstrung in their abilities to pursue or participate in real estate development. For instance, California's original statutes governing BART's joint development powers are far more restrictive than those granted to Southern California's MTA. While BART relies on powers of eminent domain, which the authority was originally granted to construct and operate the heavy rail system, MTA's statutes are more permissive and explicitly allow the agency to pursue TJD and value-capture strategies like benefit-assessment financing (Bernick and Freilich 1998). MTA was formed after BART, allowing the authority to review and improve upon BART's charter.

Most statutes governing the activities of rail transit agencies are vague with regard to TJD. Since many of transit agencies were created before the concept of TJD gained ascendancy, they often struggle to engage in TJD projects, bending the original intent of their authorizing statutes. The absence of clear state-level policy directives and authorizing legislation regarding the land-use development has very likely steered some U.S. transit agencies away from the practice of TOD and TJD.

As with federal legislation and policies, the impacts of specific state initiatives on the practice of TOD and TJD remain largely unknown. Some research has been carried out on the impacts of indirect policies, like smart growth legislation and urban containment programs, urban form, housing prices, and economic performance (e.g., Nelson and Peterman 2000; Hersh 2002), but no studies could be found that specifically assessed the effects of state initiatives on local TOD or TJD activities.

III.3 Effects of Local and Metropolitan Policies and Programs

In the past, planners and policy-makers felt little need to encourage development around transit facilities—the presence of high-capacity, high-quality transit services would act like a magnet, attracting development by its mere presence. The failure of transit, by itself, to spur growth around many station areas has prompted a 180° turn, with more and more local and regional organizations today subscribing to the view that governments must actively pursue, if not spearhead, TODs.

Over the past few years, a number of local and metropolitan organizations and governments have actively promoted TOD and TJD. In Portland, the regional government, Metro, has directed TEA-21 and local transportation funds to a regional TOD program. Operating with two full-time staff, the program has contributed funding to nine different TOD projects, ranging from $50,000 to $2,000,000 for strategic planning, site enhancements, and direct financial participation. Metro has also helped fund station-area planning on Portland's Westside MAX light rail corridor.

In the San Francisco Bay Area, the Metropolitan Transportation Commission's (MTC) Transportation for Livable Communities (TLC) provides grants (drawn from TEA-21 funds) for strategic station-area planning and urban design initiatives that strengthen the bond between transit and the neighborhoods it serves. MTC has also adopted a housing incentive program (HIP) that encourages residential TOD by rewarding local jurisdictions that locate compact housing within one-third of a mile of transit. Monies are allocated as follows: $1,000 per bedroom for projects built at 25 to 40 units per acre; $1,500 per bedroom for projects of 40 to 60

units per acre; and $2,000 per bedroom for projects of 60 units per acre or above. Affordable units can earn an additional $500 per bedroom (Ohland 2001B). Based on recent interviews, it appears most HIP funds are going toward building pedestrian paths and removing barriers to walking access to stations (Greig 2001). Several cities receiving HIP grants have used monies to raise densities and increase the affordable component of transit-based housing projects.

In addition to MPOs, other regional actors have also shown an interest in TODs. For example, San Diego's Air Pollution Control District provided $150,000 of air quality funds (from the state motor vehicle registration fee surcharge) to the city of Oceanside to support TOD planning around six stations along the Coaster Commuter rail corridor.

Even sub-regional initiatives have surfaced, such as the Transit-Oriented Development Program of the San Mateo City-County Association of Governments (C/CAG) that authorizes $2,000 in State Transportation Improvement Program (STIP) funds for each bedroom built within one-third of a mile of a rail station and with a minimum of 40 units per net area. During the program's first year, more than $2.2 million of STIP funds were transferred to local governments as a reward for building high-density transit-based housing. Table 2 shows that more than 1,200 housing additions were oriented to San Mateo County's CalTrain stations during fiscal year 2000-2001.

As with initiatives from higher levels of government, the impacts of local programs on practice remains largely speculative. This is partly due to the infancy of many of these programs, but also due to the absence of any concerted research focused on this matter. Experiences in California with regional and sub-regional programs aimed at promoting affordable housing production near rail stops suggest these programs hold promise.

Table 2. Transit-Based Housing Produced Under San Mateo County's C/CAG Incentive Program: Fiscal Year 2000-2001.

City/System	No. of Bedrooms	Grant Amount
Millbrae-BART	180	$316,334
Redwood City CalTrain	715	$1,256,548
San Carlos-CalTrain	120	$210,889
Burlingame-Caltrain	46	$80,841
San Mateo-BART	221	$388,388

Source: San Mateo City-County Association of Governments, agency records, 2001.

III.4 Private-Sector Benefits: Land Market Impacts

To the degree that TOD and TJD confer travel-time savings and enhance accessibility, theory holds that these benefits will get capitalized into land values and market rents. Numerous studies have demonstrated that being near rail stops raises property values, all else being equal, though to varying degrees. For comprehensive reviews of this literature, see Knight and Trygg (1977); Cervero (1984); Huang (1994); Kelly (1994); Cervero and Seskin (1995); Huang (1996); and Ryan (1999). The effects of TODs and TJD projects themselves on real estate values, controlling for proximity to transit, on the other hand, has been examined only sparingly.

The two main analytical approaches that have been used to measure transit's impacts on land values, and more generally, real estate market conditions, are (1) *hedonic price models*—normally multiple regression models that partial out the unique effect of proximity in transit, and the presence of TJD arrangements, in explaining property values;[13] and (2) *matched-pair comparisons*—comparisons of effective contract rents and per-square-foot land values between station areas and control sites.

Understanding the land-value benefits of proximity to transit affects not only private investment decisions but those of the public sector as well. Transit boards are likely to become more entrepreneurial, acquiring vacant parcels near planned rail stations early in the development process, if they believe they can reap profits and leverage transit-supportive projects.

There are also legal reasons why understanding the possible land-value impacts of TOD and TJD is important. Notably, evidence can be used to assess the degree to which any negative consequences or severance damages associated with transit investments are offset by accessibility benefits. Across the United States, transit authorities are being sued for severance damages by nearby land-owners who claim that the incursion of noise, vibration, and increased traffic diminishes property values. The California Supreme Court recently overturned 100 years of legal precedence in this area, allowing a broader interpretation of offsetting benefit in a condemnation case than it previously had.[14]

Impacts on Residential Properties

Studies on the impacts of being near rail on residential property values in settings as diverse as Philadelphia, Washington, D.C., Miami, Portland, and the San Francisco Bay Area have produced mixed results. A study of residential properties near the 14.5-mile Lindenwold Line in Philadelphia concluded that access to rail created an average housing value premium of 6.4 percent (Voith 1993). In a study of three light rail systems (Santa Clara County, San Diego, and Sacramento), a heavy rail system (BART), and a commuter rail system (CalTrain) in California, Landis et al. (1994) found evidence of capitalization effects on single-family housing prices, with heavy rail systems conferring the biggest benefits. Negative externalities from being too near (within 300 meters) of transit were also evident, especially in the case of commuter rail. Another California study, using matched-pair comparisons of apartment units, found monthly rent premiums on the order of 15 percent for otherwise comparable units within walking distance of a suburban BART station (Cervero 1996A). A more recent California study measured land-value premiums of 28 percent of residential properties near Santa Clara County's light rail line and substantial premiums for parcels near CalTrain's commuter rail stations as well (Cervero and Duncan 2002A).

In contrast to this positive evidence, a study of residential values near the Miami metrorail system concluded that proximity to rail stations induced little or no relative increase in housing values (Gatzlaff and Smith 1993).

[13] This is widely considered the preferred means of measuring benefit (Cambridge Systematics, Cervero, and Aschuer 1998). Assuming suitable data are available, this approach expresses premium effects as: $P_i = f(H, N, L\ C, T)$, where P_i is the estimated price (per square foot) of project i; H is a vector building and land attributes (e.g., square footage, number of rooms, age of unit); N is a vector of neighborhood characteristics (e.g., median housing income); L is a vector of location attributes (e.g., accessibility to jobs); and C is a vector of controls (e.g., fixed-effect variables).

[14] *Los Angeles County Metropolitan Transportation Authority v. Continental Development Corporation.*

Nelson (1992) found that transit accessibility increased home prices in Atlanta's lower-income census tracts but decreased values in upper-income areas.

Conflicting results are even evident among studies that focused on impacts to residential parcels very near versus farther away from rail stops. In a study of Portland's LRT, Al-Mosaind et al. (1993) found positive land-value effects only within a 500-meter walking distance of stations. Research by Lewis-Workman and Brod (1997) on experiences in both (light rail served) Portland and (heavy rail served) San Francisco Bay Area suburbs found negative land-value impacts near rail stations and positive effects farther away. Landis et al. (1994) reached a similar conclusion in their study of heavy rail, light rail, and commuter rail services in the Bay Area. In reviewing this evidence, Ryan (1999, p. 423) notes: "It is plausible that residents … beyond a certain distance from both heavy and light rail facilities do not experience relative travel time improvements; thus, property values where they are located are not bid up." It also seems plausible that whereas there are disadvantageous effects from being too close to rail transit in some settings, in other settings (e.g., highly dense, mixed-use environs, with Manhattan as an extreme example) ambient noise levels are so high and streets so busy that there are no perceived nuisances from living within a block or so of a rail stop.

While differences in research findings are likely attributable, in part, to local contextual and real estate market differences, they also likely reflect differences in methodology, measurements, and research design. As proprietary data on commercial rents and land values become more readily available and analytical abilities improve (e.g., the use of Geographic Information Systems to measure transit accessibility), differences in research approach can be expected to narrow over time.

Impacts on Commercial Properties

A wider assortment of empirical research on the capitalization impacts of rail transit have spanned across types of transit technologies. Evidence is summarized below for heavy rail and light rail systems.

Heavy Rail Transit

Most evidence on commercial property impacts comes from heavy rail systems, and as in the case of residential properties, the evidence is inconsistent. One of the earliest studies was conducted on San Francisco's BART system. Using the technique of repeat-sales ratios, Falcke (1978) found no evidence that BART increased commercial properties around the suburban Walnut Creek station or in downtown Oakland and San Francisco's Mission District over the long term. In the case of the Mission District, commercial property values near BART nearly tripled in anticipation of rail services, but this premium quickly disappeared. Such findings should be interpreted with caution not only because of the use of simple ratio comparisons but also because impacts were examined only within a few years of BART's opening. Studies of BART's longer term land-use impacts suggest greater benefits to office and commercial properties (Cervero and Landis 1997).

A study in Washington, D.C., similarly found evidence of benefits to commercial properties in anticipation of heavy rail services. Using hedonic price models, Damm et al. (1980) found a significant price elasticity of −0.69 for commercial-retail properties within 2,500 feet of a Washington metrorail station—i.e., sales prices per square foot for retail parcels fell by about 7 percent for every 10-percent increase in the distance to a station portal. No follow-up work was conducted to see if value gains held in the wake of Metrorail services, though numerous subsequent case studies suggest that Metrorail has materially benefited nearby

commercial properties (Dunphy 1995; Bernick and Cervero 1997; McNeal and Doggett 1999).

Two studies on impacts of the Metropolitan Atlanta Rapid Transit Authority (MARTA) heavy rail services reached opposite conclusions on impacts to commercial properties. Bollinger et al. (1998) found that offices within one mile of highway access points commanded office rent premiums, but those within a mile of MARTA stations typically leased for less than comparable space farther away.

In contrast, Nelson (1999, p. 78) found that commercial properties were "influenced positively by both access to rail stations and policies that encourage more intensive development around those stations." Nelson's findings suggest that the combination of targeting commercial development and forming special districts that relax parking and density requirements produce synergistic benefits. Different data years and model specifications could account for contrasting research findings from the two studies.

Rail transit improvements can also potentially play a role in the revitalization of older neighborhoods and business districts—particularly those originally developed in a transit-oriented fashion. Using an econometric model, the Great American Station Foundation (2001) found that rail station rehabilitation had a measurable effect on surrounding property values, employment, income, and tax revenues, with the benefits of these projects increasing with increasing size of the city and settlement densities surrounding the stations.

In Somerville, Massachusetts, the extension of Boston's Red Line Subway from Cambridge offered an opportunity to bring new life to Davis Square, a once-thriving commercial center that gradually declined during the post-World War II era. During the 1970s, the city lost 2,000 jobs and 13 percent of its residents. After the extension of the Red Line to Davis Square, an intensive planning process led to streetscape improvements and the upgrading of storefronts and façades. CDBG funds and state-backed bonds funded these improvements. As of 1997, two new office buildings had been completed totaling

Table 3. Predicted Economic Benefits from Station Rehabilitation.

City Size	Increased Employment	Increased Household Income	Increased Property Values (in millions)	Increased Property Tax (in millions)
Town	45-325	$80-$345	$5-$60	$.25–$3.0
Very Small City	115-825	$85-$460	$10-$65	$.5–$3.25
Small City	170-975	$140-$575	$15-$90	$.75–$4.5
Medium City	190-1,025	$155-$870	$15-$150	$.75–$7.5
Large City	260-1,435	$175-$1,055	$25-$205	$1.25–$10.25

Cities sizes are defined as follows:

- Town (less than 50,000 population)
- Very small city (50,000 to 100,000 population)
- Small city (100,000 to 250,000 population)
- Medium city (250,000 to 500,000 population)
- Large city (500,000 to two million population).

Cities with population exceeding two million were excluded from the analysis.

Source: Great American Station Foundation (2001)

170,000 square feet that were fully leased (Project for Public Spaces, Inc. 1997).

Light Rail Transit

Research on how light rail systems affect commercial property values is even scarcer, with empirical evidence only beginning to trickle in. A study of the Dallas Area Rapid Transit (DART) system compared differences in land values of fairly loosely matched pairs of comparable retail and office properties near and not near LRT stations (Weinstein and Clower 1999). The average percentage change in land values from 1994 to 1998 for retail and office properties near DART stops was 36.8 percent and 13.9 percent, respectively; for "control" parcels, the average changes were 7.1 percent and 3.7 percent, respectively. For retail uses, this study suggested a value-added premium of 30 percent. Anecdotally, the authors noted that North Park, the only regional mall served by DART LRT, generally outperformed other malls in the Metroplex area, remaining 100-percent occupied during the 1994-1998 period while rents increased 20 percent.

Several studies of LRT impacts on commercial properties in California have been more rigorous in their research designs, but again findings were inconsistent. In one study, Landis et al. (1994) were unable to assign benefits of proximity to light rail stations in California because of confounding influences—commercial projects closer to rail stops tended to be better quality projects. A follow-up study by Landis and Loutzenheiser (1995) focused on the BART system and based on hedonic price models, found no evidence of commercial properties reaping benefits from being near transit. Among the limitations of this study was the use of asking rents (as opposed to effective contract rents) and the analysis of relationships for a single year that coincided with a downturn in the region's economy.

A more recent study of LRT impacts on commercial properties was conducted by Weinberger (2000). This study examined Santa Clara County's LRT system and found that properties within one-half mile of a station commanded a premium, though those that were one-quarter to one-half mile away were worth even more. Compared to other properties in the county, the estimated monthly lease premium within one-quarter mile of LRT was 3.3 cents per square foot and for properties between one-quarter and one-half mile away, it was 6.4 cents per square foot. A follow-up study (Weinberger 2001) showed higher premiums for properties in the nearest distance band to LRT stations. A more recent analysis of land sales in Santa Clara County found that office, R&D, and retail properties near light rail stops enjoyed land-value premiums, controlling for a host of variables, but the value-added conferred to parcels in commercial districts near CalTrain commuter rail stations was even higher—more than 100 percent (Cervero and Duncan 2002B). A parallel analysis of residential properties in the county revealed smaller premiums, though the 28-percent land-value premiums were still considerably higher than those uncovered in earlier studies (Cervero and Duncan 2002A) (Figure 2). It could very well be that as congestion levels steadily worsen in areas with robust economies and tight housing markets, like Santa Clara County, the benefits of residing or doing business near transit get larger and larger.

Transit-Oriented Development

While there is substantial literature on how proximity to transit influences land values, no studies could be located that gauged real estate benefits associated with TODs themselves. This is no doubt partly because of definitional problems (i.e., what constitutes a TOD?) as well as the lofty measurement hurdles that would need to be overcome to assign land-premium benefits to multiple

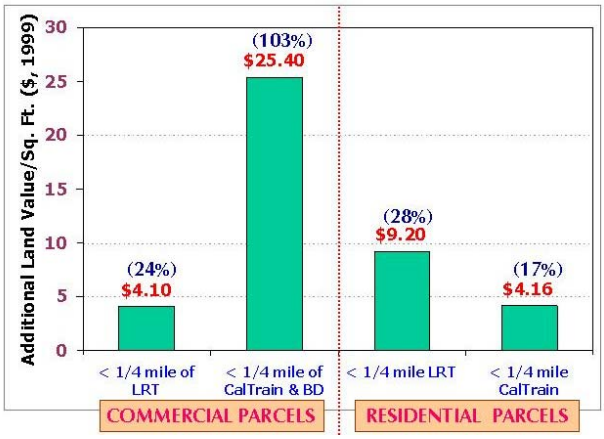


Figure 2. Land Value Premiums in Santa Clara County, Relative to LRT and Commuter Rail Transit. *Source*: Cervero and Duncan (2002A, 2002B).

parcels within a station area. Regardless, as TODs mature and evolve, exploring whether spillover benefits accrue to parcels located within master-planned communities oriented to transit, over and beyond proximity itself, would be a worthwhile endeavor.

Transit Joint Development

Some research attention has been given to measuring real estate market performance of TJD projects. In general, past research has found appreciable rent and land-value premiums associated with TJD (Sedway Cooke 1984; Cervero and Landis 1993). A study of five rail stations in Washington, D.C., and Atlanta over the 1978–1989 period found that TJD projects tended to be better performers: besides average rent premiums in the neighborhood of 7 to 9 percent, TJD projects tended to enjoy lower vacancy rates and faster absorption of new, on-line space (Cervero 1994B). TJD projects, the study found, were generally better projects—i.e., they were architecturally integrated, they enjoyed better on-site circulation (of both people and motor vehicles), and they made more efficient use of space through resource-sharing (thus creating more net leasable space). These benefits were expressed by market rents. Other matched-pair studies of TJD in metropolitan Washington have reported comparable rent premiums of up to 10 percent (Sedway Cooke 1984).

III.5 Public-Sector Benefits: Ridership Impacts

Research shows living and working near transit stations correlates with higher ridership (Figure 3). In the case of the San Francisco Bay Area, those living near transit were generally three to four times as likely to commute via transit as other residents (Cervero 1994C); research from metropolitan Washington, D.C., and Toronto found even higher market shares among station-area residents (JHK and Associates 1987, 1989; Stringham 1982), with transit capturing over half of all commute trips made by apartment-dwellers living near rail stops (Figure 4). A recent survey found that nearly 80 percent of residents living near the Portland MAX Orenco station stated their transit usage had increased since moving into their new residence (Arrington 2000). Higher ridership was partly attributable to homebuyers having received annual transit passes when they purchased homes near the Orenco station. Increased usage does not necessarily translate into major ridership gains if usage rates remain fairly low. While the Orenco survey findings say nothing about the magnitude of ridership impacts, they reveal that proximity to transit induces increased patronage for the vast majority of residents.

Another reason for high market shares in rail-served areas like Portland is "self-selection"—those with a predisposition to ride transit

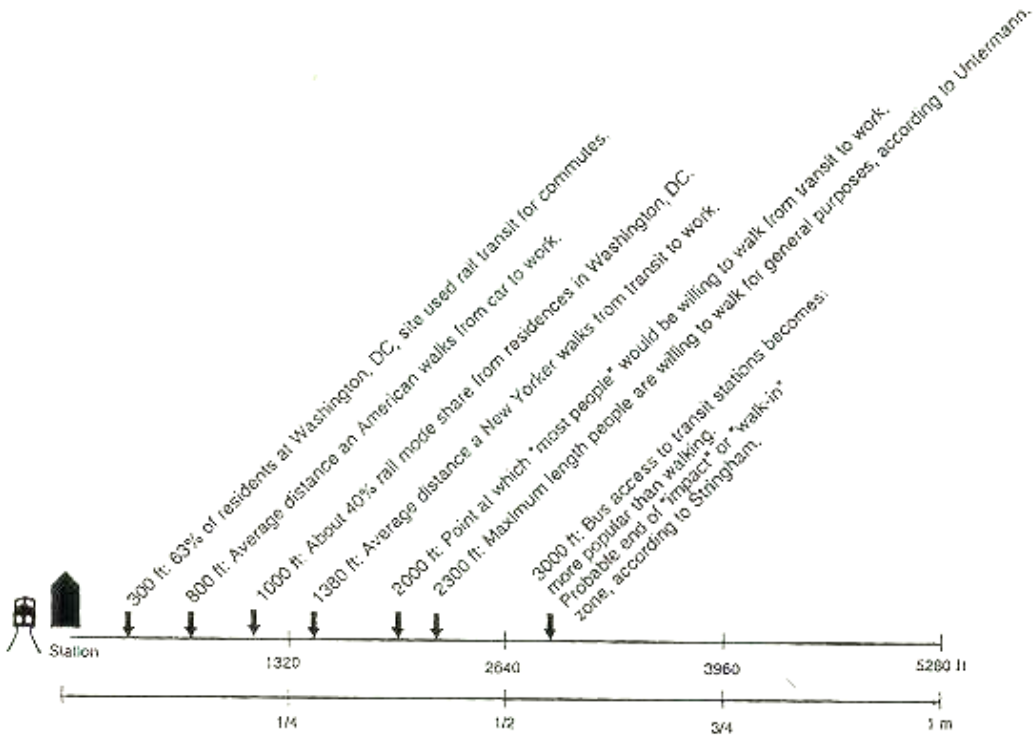


Figure 3. Empirical Evidence on Transit Ridership by Distance to Station. Ridership potential is highest within about one-third mile of a station, though Canadian experiences show that the distances people are willing to walk to transit can be stretched out to a half-mile or more. Sources: Cervero et al. (1994); Bernick and Cervero (1997).

(e.g., to reduce the stress of getting to work) consciously move to neighborhoods well-served by transit to economize on commuting. A study of Santa Clara County's light rail corridor found TOD residents patronized transit as their predominant commute mode more than five times as often as residents countywide; self-selection was evident in that 40 percent of the respondents who moved close to transit stops said they were influenced in their move by the presence of LRT (Gerston & Associates 1995). Studies also suggest a "TOD impact zone" can be stretched considerably (as much as doubled) by creating pleasant, interesting urban spaces and corridors (Untermann 1984).

Even higher capture rates have been found among those working near downtown and built-up urban rail stations (JHK and Associates 1987; Cervero 1994A). Because many employees have access to free parking, transit modal splits tend to be lower among those working near suburban rail stations. Shoppers are also drawn to retail stores well-served by transit. A 1993 survey found that over 60 percent of the customers surveyed at downtown San Diego's Horton Plaza arrived by transit or on foot (Bragado 1999).[15] Comparably high shares of shoppers had arrived by transit at the San Francisco Center, an enclosed, suburban-style shopping mall with large anchor tenants in downtown San Francisco, near the Powell Street BART Station (Cervero 1993A).

[15] This analysis combined walking and transit as forms of access; thus, how much was due to the proximity of the plaza to hotels and a convention center versus nearness to a transit stop is unclear.

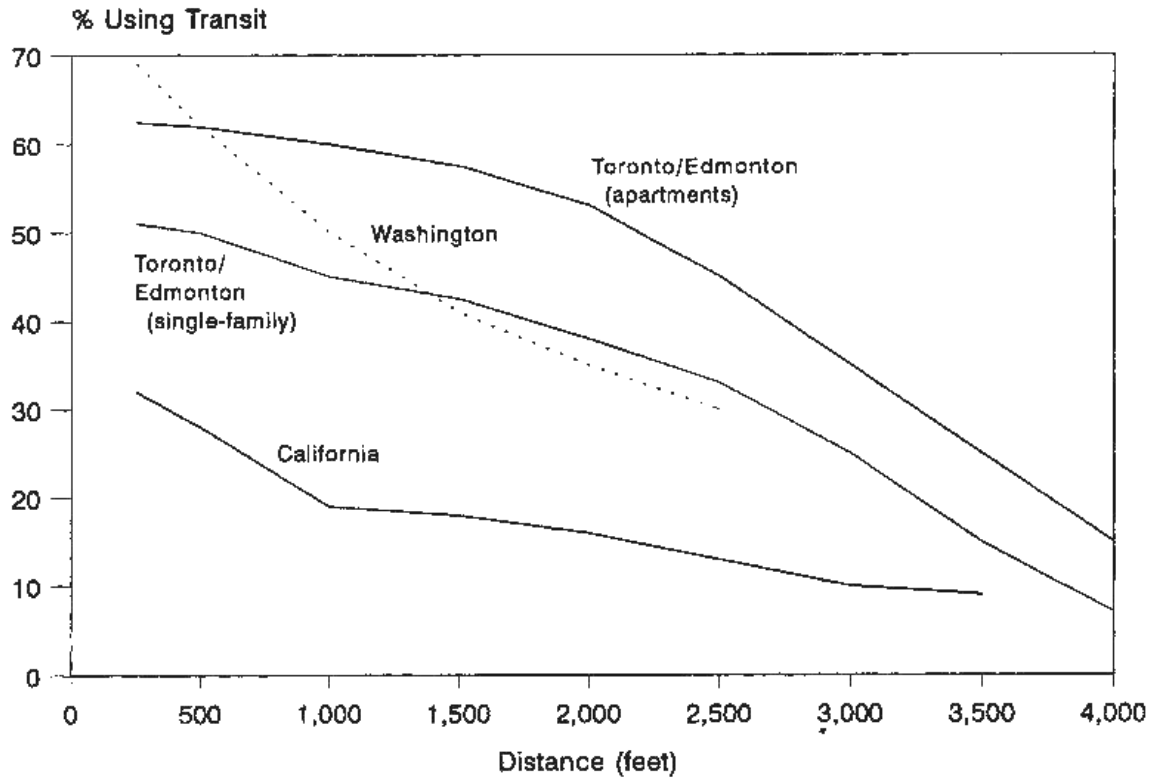


Figure 4. Rail Transit Mode Shares by Distance to Residential Sites: Experiences from Canadian Cities, Metropolitan Washington, D.C., and Urban California. Within one-quarter mile of stations, transit captured between 20 percent (in California) and 60 percent (in Canada) of all work trips, presumably because of residential-sorting and self-selection. *Sources:* Cervero (1993A); Bernick and Cervero (1997).

In addition to TODs, research shows that TJD is associated with high rates of transit usage. In a 1983 study of nine TJD projects in the United States, Keefer found that every 1,000 square feet of new commercial floorspace near a rail station generated an additional six transit trips per day, yielding an additional $11.4 million (in 1982 dollars) in annual farebox receipts. Case studies from the early 1980s estimated that fully realized joint development at rail stations with buoyant real estate markets could increase ridership by 10 to 25 percent (Sedway Cooke 1984). An empirical investigation of TJD projects in metropolitan Washington, D.C. and Atlanta found more modest impacts, though interdependencies between office development and ridership was statistically found—jointly developed office space atop or near a rail stop spurred ridership, and ridership in turn spurred office development (Cervero 1994B).

Some observers have been quick to point out that an important, though often unnoticed, ridership benefit of TODs is increased off-peak and reverse-flow patronage—i.e., mixed-use, all-day trip generators help fill up trains and buses at all hours of the day and in both directions (Sedway Cooke 1984; Salvensen 1996; Bernick and Cervero 1997). TODs feature land-use arrangements that produce all-day and all-week trips, such as entertainment complexes, restaurants, and

other mixed uses. Thus, an important benefit of TODs and perhaps TJDs as well is that they enhance cost-effectiveness, in the sense of squeezing out efficiencies in the deployment of costly rail services. Like any mixed-use activity center, they fill up under-utilized capacity. While no studies to our knowledge have explicitly associated such ridership benefits with TOD or TJD, studies of Scandinavian and Brazilian experiences suggest that inter-mixing of land uses along rail corridors can produce bi-directional flows, thus making efficient use of expensive rail infrastructure (Cervero 1998A).

III.6 Other Public-Sector Benefits

Most other societal benefits attributed to TODs and TJDs derive, in some way, from ridership gains. The ultimate objective of ridership increases is to relieve traffic congestion, improve air quality, reduce fossil-fuel consumption, and the like. In this sense, TOD-induced ridership increases are an intermediate step toward the larger goal of improved mobility and environmental sustainability. No empirical research has been produced to date that traces causal pathways between TODs or TJDs, resulting ridership gains, and eventual improvements in traffic or environmental conditions. Given the daunting methodological challenges of conducting such a causal analysis, qualitative case studies have been largely relied upon in making the connections between TODs and broader transportation and environmental outcomes.

Larger Social Benefits

The impacts of TOD and TJD on air quality, energy conservation, social equity, and other public-policy concerns have never been quantified. While anecdotes are sometimes offered—e.g., Portland's violations of carbon monoxide standards in the CBD have plummeted since MAX's arrival (Arrington 1996)—in truth there have been no rigorous studies to date that have clearly assigned environmental, social equity, and economic development benefits to TOD or TJD, in and of themselves. Nor is there any evidence that TODs or TJDs relieve traffic congestion. Indeed, some argue TODs worsen traffic conditions, a view that many residents seem to buy into when they oppose mixed-use, infill development near their homes (Bernick and Cervero 1997). In a paper critical of TOD prepared for the Heritage Foundation, Wendell Cox wrote the following:

> Transit-oriented development increases congestion. The overwhelming majority of travel to proposed transit-oriented developments will be by automobile. This will strain road space, slowing traffic and increasing pollution as a consequence. (Still 2002, p. 47)

Some might consider this to be a myopic view in that over time TODs will reduce automobile dependence and thus total vehicle-miles traveled (VMT). Even most proponents concede that TODs create localized, spot congestion but counter-argue that, if they are well-designed and integrated, they can reduce regional traffic volumes and ambient congestion levels (Bernick and Cervero 1997). Anecdotal experiences are about the best insights we currently have on traffic impacts. Nelson and Peterman (2000) present evidence showing that TOD-friendly Portland experienced average commute-times savings between the mid-1980s and mid-1990s whereas mean commute times rose slightly over the same period in less-TOD-friendly Atlanta. And whereas VMT per capita rose by just 2 percent in metropolitan Portland, it rose by 17 percent in metropolitan Atlanta over the same period. Of course, these two metropolitan areas differ considerably more than just their track records with TOD, thus one should not read

too much into such numbers. Only with time will the traffic impacts of TOD and TJD begin to more clearly reveal themselves. The fact that many parts of the country are pursuing TOD in earnest on social and environmental grounds suggests that, whether rightly or wrongly, many individuals in positions of power believe transit stations offer considerable advantages in rejuvenating inner-city neighborhoods and catalyzing new transit-supportive growth nodes.

The literature points to other possible benefits of TOD and TJD, though in many ways these represent intermediate steps toward ultimate hoped-for outcomes. Included here are economic revitalization of inner-city communities; enhanced urban landscapes; open space conservation; cost-efficiencies in the construction of public and private facilities; and an explicit context for pursuing smart-growth agendas (Urban Land Institute 1979; Keefer 1985; Bernick and Cervero 1997; Porter 1997). Empirical evidence in these regards is even thinner.

TODs are also commonly viewed as natural catchments for targeting affordable housing and promoting infill development. Experiences with affordable housing production near rail stations in the San Francisco Bay Area and other areas—most often leveraged through financial incentives—seem to bear this out. While city-dwellers often viscerally react against infill and higher rise building construction, especially in and around their own neighborhood, many nonetheless understand, on an intuitive level, that if there is any logical place to be increasing densities, it is around rail transit stations. Whether it is from first-hand experiences of hopping on a train in vibrant parts of Paris or New York or based on their own instincts that curbing congestion in sprawling suburbs through road expansion is hopeless, the idea of creating urban villages around rail transit station seems to resonate broadly and has a certain intuitive appeal.

Financial Impacts

One by-product of TOD-generated ridership gains where there have been efforts to quantify impacts is in the area of financial returns. To date, most research on revenue impacts have focused on joint development programs, such as ground leases and station-connection fees. A 1990 analysis of TJD projects found capital contributions (e.g., one-time in-lieu-of payments by private interests for items like station plazas) generally represented no more than 2 percent of annual capital expenditures by rail transit agencies (Cervero et al. 1991; Landis et al. 1991). In the case of New York City, however, capital contributions to the Metropolitan Transit Authority (MTA) were as much as 37 percent of annual investment outlays in the mid-1980s. Revenues from air rights leases, station-connection fees, land rents, concessions, and other income-producing joint-development initiatives, however, made up no more than 1 percent of operating budgets of nine U.S. transit systems that were studied (Cervero et al. 1991).

Some research suggests that the most substantial revenue impacts of TJD are indirect, mainly in terms of increased farebox receipts. A time-series analysis of experiences in Washington, D.C. and Atlanta showed that the fare-revenue increases from ridership gains attributable to TJD exceeded annual air rights and land lease revenues for both WMATA and MARTA (Cervero 1994B). Keefer (1983, 1984) similarly showed that higher farebox receipts were a substantial portion of the revenue benefits associated with TJD projects in Philadelphia, Miami, Seattle, and a handful of other U.S. cities.

IV. IMPLEMENTATION

Many transit professionals and practitioners are already convinced that TOD and TJD, if done right, yield substantial benefits. For them, understanding ways of effectively bridging theory and practice is of utmost importance. That is, how do successful TODs and TJD projects get implemented? People want to know not only how and why projects get built, but also about the role of public policies in leveraging and facilitating the process.

Governments have a number of tools at their disposal to promote and "prime the pump" for TOD and TJD implementation. A recent survey revealed that the three major public-sector actors—transit agencies, redevelopment agencies, and municipalities—in California relied on a mix of available tools, to varying degrees, to bring about some form of TOD around the state's rail systems (Cervero 1998B) (Table 4). These and other supportive policies—and what we know about their importance in bringing about TOD and TJD projects—are reviewed in this chapter. Before turning to the role of public-sector initiatives, however, it is important to understand elements of market demands for TODs and TJDs from a private-sector perspective.

IV.1 TOD Markets

A body of research and empirical evidence has shown that TOD and TJD cannot overcome a flat or anemic local real estate market. The absence of hoped-for land-use changes around many rail transit stations—not only in slow-growth cities like Buffalo and Pittsburgh but also in rail cities with buoyant regional economies, including Atlanta and San Francisco—often stems from the absence of a *bona fide* market demand (Knight and Trygg 1977; Cervero 1984; Huang 1996). It is widely accepted that transit investments do not so much generate new growth but rather redistribute where growth takes places—growth that would have occurred with or without transit. However, there must be growth to redistribute, and not in all cases where U.S. rail systems have been built has there been sufficient market demand for meaningful station-area development to occur.

The markets for TOD and TJD are best expressed through real estate transactions. As reviewed in the previous chapter, studies of rail systems in Philadelphia, Washington, D.C., Miami, Portland, and the San Francisco Bay Area have reached mixed conclusions on

Public-Sector Actor	Use of Agency Land	Underwriting Land Costs	Help with Land Assembly	Financial Incentives	Fast-Tracking Reviews	Sharing of Parking
Redevelopment Agency	✔	✔	✔	✔		
Transit Agency	✔	✔	✔	✔		✔
Municipality		✔			✔	

Source: Cervero (1998B)

Table 4. Policy Tools Used in California for Promoting and Leveraging Transit-Oriented Development

transit's capitalization effects. Recent research in settings with severe peak-hour traffic congestion and healthy real estate economies suggests that land-value premiums can be appreciable (Cervero and Duncan 2002A). In addition to land-value impacts, insights into the market demand for housing and commercial space in TOD and TJD settings can also be revealing.

Who makes up the market of TOD residents? Research confirms expectations: many are small, childless households at the beginning or later stages of their life cycles who purposefully gravitate to areas that have comparative accessibility advantages of place of employment (Voith 1991; Cervero and Menotti 1994; Cervero 1998A). In the San Francisco Bay Area, for example, surveys revealed that over 90 percent of transit-based households had just one or two occupants compared to 58 percent of households in surrounding census tracts. A survey of five apartment complexes near East Bay BART stations found that 43 percent of employed residents worked in downtown San Francisco or Oakland compared to just 13 percent of employed residents in the surrounding tract (Cervero and Menotti 1994). The *Wall Street Journal* recently ran a story that highlighted the overheated market for TOD-living near Los Angeles's recently opened Western Avenue station. Over 2,500 people have applied for the first 60 affordable housing units at a new complex built on MTA land absent any transit-agency money (Holt 2001). In an interview for this article, David Stockert, president of Atlanta's Post Properties, Inc., an apartment developer that has been particularly active in the TOD market, remarked: "people like living in these communities for the same reasons they like living in New York City" (p. B9).

One limitation of focusing on "revealed preferences" for TODs is, at least in some settings, the shortage of *bona fide* TODs among which consumers can choose. In some ways, the market for TODs and TJDs is caught in a catch-22: there are limited examples in part because of questionable market feasibility, and the market potential is questionable precisely because there are limited examples.

Accordingly, some researchers have turned to "stated preference" surveys, backed by visual simulations (as opposed to "revealed choice" studies). One line of stated-preference research for TOD-like settings have been visual preference surveys (VPSs), wherein residents rate slide images of communities in efforts to build community consensus on desirable urban designs. More dynamic visual simulations have also been used to probe the degree in which residents of proposed TODs might be willing to trade off higher-than-usual residential densities near transit stops in return for public amenities (e.g., in-neighborhood parks). One visual-simulation study in the Bay Area confirmed this hypothesis, revealing that amenities can, in the minds of many potential TOD residents, compensate for densities that are 50 percent higher (Cervero and Bosselmann 1998).

IV.2 Supportive Public Policies: Finance and Tax Policies

Vital to the implementation of TOD and TJD projects is a conducive fiscal environment. As discussed later in this chapter, the risks of building projects near transit stations, particularly in the suburbs where the automobile reigns supreme, can be substantial. For localities, mounting a long-range strategic planning campaign to create a TOD can also be costly. A growing number of government and public institutions recognize this and have proceeded to provide financial and tax incentives to help leverage TODs. This section reviews experiences with grants; sliding-scale impact fees; tax abatement; creative financing; direct public-

sector financial participation; benefit assessment districts; enterprise zones; tax increment financing; and loans.

Grants

Direct financial assistance will propel a TOD or TJD project forward as quickly as anything. Governments are the chief conduits of grant assistance, effectively transferring resources to the private sector and some of the risks to the public sector. Assistance from private foundations can also be helpful. In the case of the emerging Fruitvale Transit Village in Oakland, grants from the Irvine, Ford, and Hewlett Foundations were instrumental in financing some of the necessary advanced strategic planning.

The cumulative effects of funding programs at the federal, state, and regional levels, as reviewed in the previous chapter, have unquestionably made TOD planning and implementation more financially feasible in some instances. Early Federal Urban Initiatives grants and Community Development Block Grants (CDBGs) seeded redevelopment in a number of U.S. cities with decaying rail stations. Most contemporary grants, such as Housing Incentive Production awards or Livable Communities assistance, have been one-time "shots in the arm." Some, like the federal Transportation and Community System Preservation (TCSP) program funding, are competitively awarded. While discretionary earmarked grants provide much-valued resources, some municipalities interested in pursuing TOD are uneasy with the fact that most grants do not provide long-term and guaranteed revenue streams.

Sliding-Scale Impact Fees

Impact fees have become an indispensable form of infrastructure financing in many parts of the United States. While impact fees relieve municipalities of fiscal burdens by passing on public-facility charges to developers, they can work against affordable housing goals. In some California municipalities, impacts fees and required exactions already exceed $30,000 per unit and account for more than 15 percent of total housing production costs (Landis et al. 2000).

One way to cushion the burdensome effects of impact fees, on both developers and consumers, is to provide financial relief and even exemptions for certain types of projects, like TODs. Some communities, including Orlando, Florida, and San Jose, California, have introduced forms of sliding-scale impact fees to promote compact, mixed-use development in areas well-served by transit (Table 5). This often takes the form of lowering trip generation estimates to reflect empirical evidence that shows offices and apartments near transit stops can "de-generate" vehicle trips (through a combination of increased transit usage and lower car ownership rates).

Since the responsibility for building, operating and maintaining transit services and the regulatory control of land use is not often held by the same governmental body, a transit agency is rarely able to have regulatory authority on land uses surrounding its right-of-way. In a national survey of 300 transit agencies, White and McDaniel (1999) found that impact fees were used by only three transit agencies as a means to promote TOD (Broward County Mass Transit in Florida, Tri-County Metropolitan Transportation District [Tri-Met] in Oregon, and the Triangle Transit Authority in North Carolina). In two of these cases—Florida and Oregon—the state governments have taken lead roles in regional planning, concurrency, and the coordination of transportation and land use. These unique roles by state governments may explain how the transit agencies are allowed to play a part in land-use regulation to encourage TOD.

Table 5. Recommended Impact Fee Adjustments in Santa Clara County, California. Mixed-use projects with housing and retail components within 2,000-foot walk of a rail station that introduce financial incentives, like discounted transit passes, can be expected to generate vehicular traffic 25 percent below that estimated by standard trip generation equations. Municipalities are encouraged to lower traffic impact fees accordingly.

Trip Reduction Strategy	Maximum Trip Reduction
Mixed-use Development Project	
With housing and retail components	*13% off the smaller trip generator*
With hotel and retail components	*10% off the smaller trip generator*
With housing and employment	*3% off the smaller trip generator*
With employment and employee-serving retail	*3% off employment component*
Effective TDM Program	
Financial Incentives	*up to 5%*
Shuttle Program	
– Project-funded dedicated shuttle	*3%*
– Partially funded multi-site shuttle	*2%*
Location Within 2,000-Foot Walk of Transit Facility	
Housing near LRT or Caltrain Station	*9%*
Housing near a Major Bus Stop	*2%*
Employment near LRT or Caltrain Station	*3%*
Employment near a Major Bus Stop	*2%*

Source: Santa Clara County Congestion Management Agency, *Santa Clara County Congestion Management Plan*, San Jose, California. 1998.

While impact fees provide revenues that can go toward neighborhood enhancements near rail stations, none of the impact-fee programs introduced by transit agencies provide credits or adjustments for projects that are very near or functionally integrated with transit facilities.

Tax Abatement

Tax relief can entice developers to site projects near transit stops. In 1995, the state of Oregon enacted legislation that granted property-tax abatements, for as long as 10 years, for multi-family housing built within an easy walk of a major transit facility. Besides promoting TODs with affordable units, the abatement bill seeks to "stimulate the construction of multiple-unit housing in the core areas of Oregon's urban centers to improve the balance between the residential and commercial nature of those areas, and to ensure full-time use of the areas as places where citizens of the community have an opportunity to live as well as to work" (Oregon Revised Statutes, Section 307-600-1: www.leg.state.or.us/95reg/measures/hb3100.dir/hb3133.en.html). The cities of Portland and Gresham currently use abatements (Photo 3). So far, Portland has abated seven multi-family housing projects worth a combined value of nearly $80 million (Table 6) (Parsons, Brinckerhoff, Quade and Douglas 2001A).

Photo 3. Tax-Abated Housing Built in Gresham, Oregon, Near MAX Light Rail Line.

Table 6. Property Tax Abatements for Transit-Oriented Developments in Portland, Oregon, 2000.

Project	Units	Total Development Cost
160th & Burnside Apartments	51	$2,454,000
Center Station & Center Square	228	$20,012,000
Collins Circle	124	$13,324,000
Floyd Light Apartments	51	$3,319,000
Gateway Condos	24	$1,430,000
Hazelwood Apartments	119	$10,449,000
Russellville School Phase I	282	$20,192,000
Stadium Station	115	$8,469,000
Total	994	$79,649,000

Source: Parsons, Brinckerhoff, Quade & Douglas (2001A)

Tax abatements, like most local fiscal privileges, require the passage of state enabling legislation, something that few states have been willing to do. Because tax credits and abatements effectively subsidize development, critics charge that such initiatives are inequitable, forcing non-abated properties to pay disproportionately higher taxes. In fiscally conservative environments, it is highly unlikely that tax abatement, as a tool for inducing TOD, will garner much political support.

Creative Financing

Mixing and matching funding sources enlarges "the pot" and spreads the risks and opportunities. Creative financing means being resourceful and opportunistic. Projects like the Mercado at San Diego's Barrio Logan station were financed through a mix of state and federal tax credits pooling together the resources of private lenders and a host of local agencies, including the San Diego Housing Commission, the Centre City Development Corporation, the San Diego Redevelopment Agency, and the San Diego Housing Trust Fund (see page 50). Creative financing is also behind the recently unveiled plans to build a transit village at San Francisco BART's West Dublin/Pleasanton station and Fruitvale station (where 20 different sources of funds were tapped into).

Direct Financial Participation

Equity participation often takes the form of a transit agency or redevelopment authority writing down land costs in return for future cash flow. In the case of Ballston's Metro Center, WMATA waived the collection of fair market rent and instead accepted a percentage share of gross proceeds from condominium sales. Public entities have used other tools to jump start TODs and directly participate in project development, including issuing tax-exempt bonds, low-interest loans, and loan guarantees. Los Angeles' Grant Central Market, for example, was leveraged by the redevelopment agency and transit authority (MTA) fully backing $13.5 million of taxable bonds and $26.5 million of tax-exempt bonds issued for the project. In Portland, federal grants are used to purchase station sites on

CREATIVE FINANCING OF A TRANSIT VILLAGE—BARRIO LOGAN

The $12.3 million project was financed through a combination of public and private sources. The deal was negotiated between six equity partners under a variety of terms. Key was the provision of tax credits in addition to public assistance with land assemblage, deferral of fee payments, subordination of loans, and the provision of up-front infrastructure improvements. Barrio Logan demonstrates that vested interests can get together and hammer out a cost-risk sharing arrangement with the prospects of ideally sharing in the downstream rewards. The financial package agreed upon by all parties that gave Barrio Logan the green light is itemized below.

Funding Source	Funding-Loan Amount	Funding-Loan Share	Terms
Private Financing			
☐ American Savings Bank	$2,800,000	22.9%	30-year loan, 8.75%, fully amortizing
☐ Federal Home Loan	$800,000	6.5%	40-year loan, 3%, interest only, residual receipts
☐ Affordable Housing Program Tax Credits (Local Initiative Support Corporation, California Equity Fund)	$5,100,000	41.6%	Equity investment
Subtotal	*$8,700,000*	*71.0%*	
Public Financing			
☐ San Diego Housing Commission/Trust Fund	$1,425,000	11.6%	30-year loan, 6% residual receipts, forgivable on sale
☐ San Diego Redevelopment Agency/Centre City Development Corporation	$1,966,200	16.0%	Land write-down, subsidy
☐ City of San Diego	$161,000	1.4%	Development fee deferral
Subtotal	*$3,552,200*	*29.0%*	
Total	*$12,252,200*	*100.0%*	

Source: Bernick and Cervero (1997)

the open market, reselling them at discounts based partly on projected ridership.

Tax-exempt bonds are often relied upon by transit agencies as a source of revenue for co-participating in real estate ventures. Proceeds

from tax-exempt bonds were used to co-finance the Almaden Lake Village housing project at a light rail stop in San Jose. The city of San Jose provided $27 million in tax-exempt bonds to match some $5.3 million from private sources. These bonds were used by the city as bargaining chips in negotiations to ensure that 50 of the high-density residential units in the project (20 percent of the units) would be available to low-income households for a period of 30 years (Lefaver et al. 2001).

Since the Federal 1984 Tax Reform Act placed an upper limit upon the amount of tax-exempt private activity bonds that can be generated, each state has created its own method for determining how these bonds will be allocated among competing projects. Lefaver et al. (2001) recommend that each state's criteria for this allocation be altered to increase the competitive advantage of transit-oriented projects. In California, these criteria are written by the staff members of the California Debt Limit Allocation Committee (CDLAC) with input from the public, and can be amended after public review. In 2000, criteria were amended to favor multi-family rental units to reflect the State Treasurer's commitment to sustainable development.[16] Of the 140 criteria points possible in this process, sustainable projects can garner up to 25 points, 15 of which are dependent on the project being located in a designated community revitalization area. The remaining 10 points are awarded based on site amenities, one of which is the location of a project within a quarter-mile of a planned or existing public transit corridor. To increase the competitive edge of TOD projects, Lefaver et al. (2001) recommend increasing the number of points given to projects that qualify under these criteria, and to increase the zone of qualified projects to include projects within one-half mile of a transit corridor. California also sets aside a certain amount of bonds allocated each year for specific categories of projects. Lefaver et al. (2001) recommend the addition of a new TOD category. Other states, such as Virginia and Oregon, do not have criteria for their tax-exempt private activity bond allocations. The authors recommend that these states promptly adopt criteria that weigh the roles of TODs in placing communities on sustainable pathways. Further study would help in assessing the likely effectiveness of promoting TODs through bond allocations.

Tax Increment Financing

Tax increment financing (TIF) establishes a base-year tax level for a district. Any taxes generated above that base-year amount through increases in property values are earmarked for use within the same district for improvement projects or services. Usually, these funds are used for infrastructure improvements that will make the area more attractive to private developers and businesses. In Pleasant Hill, California, TIF was used by the redevelopment agency to underground utilities and install new water and drainage systems in the vicinity of the BART station. At the Fruitvale BART station in Oakland, California, a combination of tax increment financing and Federal Livable Communities Initiative funds were used to fund a police substation, a pedestrian plaza, and bus turnaround (Bernick and Freilich 1998). Another prominent example is San Francisco's Market Street corridor between the Embarcadero and Powell Street BART stations, where the $25-million bill for streetscape and beautification improvements (e.g., public squares, street furniture, tree plantings) was paid for through TIF (Photo 4)

[16] California's State Treasurer, Philip Angeledes, is known in the realm of TOD for having developed the Laguna West master-planned community in southwest Sacramento County, a bold attempt to build a transit-oriented suburb in an auto-centric landscape, using the TOD design principles of Peter Calthorpe.

(National Council for Urban Economic Development 1989).

Tax increment financing of transit-station-area improvements can be a useful tool to encourage TOD in small metropolitan areas as well. In 1984, the city of Cedar Rapids, Iowa, completed construction of the Ground Transportation Center, a TJD project that includes an intermodal transit terminal, a taxi-minibus-car pick-up/drop-off area, a 500-space parking garage connected by a skywalk to the terminal, a 15-story, 160,000-square-foot private office building, a pedestrian mall, and a 96-unit elderly and handicapped housing project (National Council for Urban Economic Development 1989). To finance the project, community development and transit officials created a tax increment financing district as backing to float a $4.5-million bond that paid for the local share of the project's capital costs and the construction of the parking structure's ramp.

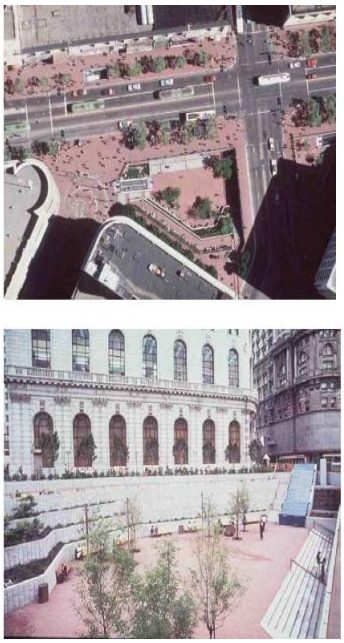


Photo 4. Landscaping and Public Space Improvements Funded through Tax Increment Financing at BART's Powell Street Station.

Care must be exercised when creating a TIF district. Since revenue in-take relies on an increase in property values, such districts should only be considered in areas where there is a reasonable expectation that new development will occur (Urban Land Institute 1979; National Council for Urban Economic Development 1989). If growth does not occur, and if (as is usually the case) bonds are floated with the financial backing of an assumed increase in property values that does not materialize, there is a significant risk of default.

The key to the successful use of funding techniques like TIF is the establishment of a redevelopment zone around station areas to help leverage private investments. Lefaver et al. (2001) contend that in most instances, redevelopment agencies are best suited for jump-starting TOD projects, partly because of their access to TIF. The authors also recommend the use of sales-tax subventions (as opposed to property-tax subventions) as an additional source for funding TOD projects. One such example is the Sequoia Station project in Redwood City, California — a commercial development on a 17.4-acre site next to the CalTrain commuter rail station — where the redevelopment agency has underwritten part of the private development costs, up to $300,000 per year for as many as 15 years, using either property or sales tax increments (Lefaver et al. 2001).

Benefit Assessment Districts

Benefit assessment districts—where properties and businesses that benefit from proximity to transit are assessed an addition tax—also can be formed to secure bonds for TOD investments, providing a guaranteed stream of assessment revenues. Based on a review of the literature, Darche and Curry

(1990) contend that the assessed value of properties in a TOD assessment district should be at least three times the bond par amount. Los Angeles originally hoped to pay for as much as 5 percent of the capital cost of planned rail investments using Benefit Assessment District financing, but legal challenges over the *rational nexus* between assessed payments and transit-conferred benefits resulted in the program being cut back significantly. While used mainly for financing capital improvements, revenues from benefit assessment districts can also go toward operations, such as in Denver where assessments against downtown properties to finance the transit mall went toward general operations, repairs, snow removal, security, and other day-to-day expenses. If non-capital assessments are to gain acceptance, property-owners need to be convinced that transit confers real and sustainable economic benefits to both their own parcels and the region at large.

Empowerment Zones and Enterprise Communities

While not directly intended for encouraging TOD, the tools and resources available from federally sponsored Empowerment Zones and Enterprise Community (EZ/EC) programs offer the opportunity for policy-makers to combine economic development pursuits with initiatives to promote transit-friendly environments. Areas that qualify for EZ/EC status receive grants and tax credits that can be used to attract businesses and development in depressed inner-city neighborhoods. These areas are also eligible to receive special consideration when applying for various other federal funding, including transportation, other infrastructure, and community development programs (Cervero et al. 1994).

In San Diego's Barrio Logan neighborhood, the financing advantages of an enterprise community designation were used to provide $6 million in low-interest loans toward the construction of a shopping center within walking distance of the Trolley (Ohland 2001A). The cities of Buffalo and Baltimore similarly secured EZ/EC funding for community development programs near light rail stops.

Lefaver et al. (2001) recommend expanding the concept of the enterprise zone to enhance its applicability to TODs. Notably, they recommend that the state of California allow areas adjacent to transit lines to qualify as enterprise zones, and that projects within these transit enterprise zones receive special tax treatment. Benefiting projects, the authors contend, should also be required to have a set minimum proportion of affordable residential units.

Loans

Public entities can also lure developers to station areas by providing loans, usually either below market rate or in the form of guarantees for securing funding from commercial lenders. San Diego's Barrio Logan project relied on 30-year loans from both commercial banks and the public sector (San Diego Housing Commission/Trust Fund) to move the affordable housing component forward. Other California transit-based housing projects that owe their existence, in part, to below-market-rate loans include Atherton Place and Strobridge Apartments (BART system), Apartments at Almaden Lake and Ohlone Court (Santa Clara Valley Light Rail system), and Holly Street Village (Los Angeles Metropolitan Transit Authority light rail system) (Bernick and Cervero 1997).

Even federal lenders have entered the fray. Fannie Mae, the nation's largest provider of mortgage money, invested $1.5 million in a 109-unit single-family housing project under construction "within a football field's distance

from the Sylmar-San Fernando Metrolink (commuter rail) station" in Southern California (Still 2002, p. 46). The mortgage investor also designed a special loan for the project, called the Los Angeles Transit Mortgage, which provides flexible credit guidelines and low down payments to buyers. Metrolink, owned and operated by the Southern California Regional Rail Authority, sweetened the deal for homebuyers by giving them two free 1-month Metrolink passes.

IV.3 Supportive Public Policies: Land-Based Initiatives

Property holdings provide an opportunistic context for leveraging TODs and TJDs. Experiences with four land-based approaches—assembly, swaps, banking, and sale/leases—are reviewed in this section.

Land Assembly

The ability of governments to assemble land (through eminent domain, condemnation, or redevelopment takings) and potentially write down costs is attractive to many developers. Assistance with land assembly is particularly important when land is chopped up among multiple owners. If developers face the prospect of negotiating individual land purchases among multiple property owners, any one of whom can renege and potentially doom a project, little is likely to happen. In some states, redevelopment authorities with special privileges have been instrumental in acquiring and assembling land. Often, where transit agencies are reluctant to use powers of eminent domain for the purposes of land assemblage, a redevelopment agency with jurisdiction around transit stations can play a critical role by providing the statutory legitimacy to engage in land assembly activities. In California, projects like La Mesa Village Plaza (San Diego) and Ryland Mews (Santa Clara County) are examples of transit-based housing projects achieved only after the local redevelopment agency assembled multiple parcels into a site of sufficient size to support a large-scale project. The *quid pro quo*, of course, is that localities stand to cover their upfront expenses, perhaps many times over, through higher downstream property tax receipts and more viable, self-sustaining neighborhoods.

The availability of suitable land can often be a deal-maker or deal-breaker. Some state departments of transportation (DOTs) have significant land holdings around transit stations. This has not gone unnoticed by some municipalities and transit agencies that see a fortuitous opportunity to leverage TOD. In both Maryland and California, policy efforts are underway to eliminate barriers to using DOT-owned properties for TODs.

Land Swaps

Land swaps offer local governments the opportunity to benefit from a TJD project by increasing their participation and vesting co-ownership in a development. Sometimes, a developer may secure the land necessary to accommodate a TJD project, but not the local government approvals to proceed, while the local government has the power to allow the development, but may not feel there is sufficient benefit to their constituents to do so. In such instances, a land swap policy offers local land-use approvals for the project in exchange for the title to ownership of the land itself.

In the case of Miami's Dadeland South project, the developer and the county conducted a land swap where the developer gave land to MDTA in exchange for rights to build a multiplex project consisting of a hotel, offices, and retail stores at the site. The developer also paid for and built a parking garage, where MDTA owns 1,000 spaces and the offices on-site use the other 650 spaces

(Price Waterhouse LLP 1998). A land swap was also used to accommodate the Southern Bell Tower regional headquarters building at MARTA's North Avenue Station. There, an on-site historic landmark property was swapped for properties on the remainder of the site that Southern Bell needed for its development. Southern Bell also agreed, at the request of city officials and MARTA, to reduce the size of a proposed parking facility to discourage driving, reduce congestion, and increase rail patronage.

Land Banking

With enough foresight and money to spend, public agencies may opt to speculate on the future value of their own public investments. By purchasing land prior to the construction of a new transit station or the initiation of rail services, a transit or redevelopment agency may choose to purchase parcels in the open market and then "bank" the land until land prices rise appreciably. Land reserves may be sold at a profit or sold to a developer with contractual agreements or covenants specifying the transit-oriented nature of future development on the site. Scandinavian cities like Stockholm and Copenhagen have a long tradition of acquiring land in advance of demand, banking it over several decades, and eventually reaping the value-added for land-price increases (Cervero 1998A). Transit villages dotting rail lines in both cities are a testament to this proactive policy of banking land for the explicit purpose of shaping urbanization patterns.

Land banking offers several benefits. First, the purchasing agency can anticipate real estate acquisition cost savings since land can be bought at a lower cost prior to speculation. Second, parcels can be more easily assembled prior to the onslaught of land speculation. Third, value capture can be used to reap the benefits of increasing land values that result from facility investments. Lastly, public agencies can gain control over the "timing, pace, and character" of development in neighborhoods surrounding transit stations (Howard et al. 1985).

Institutional obstacles can stand in the way of land banking and other land acquisition efforts. The feasibility of land banking is wholly dependent on the willingness of landowners to cooperate. If land acquisition is carried out in station areas where the market is relatively inactive, then owners are not likely to object. However, if local owners feel they are sitting on a gold mine and sense opportunities for profit, they may object to a public agency elbowing in on their holdings and intruding into free-market transactions (Martz 1988). This may leave transit agencies in a "double-bind," where parcels prime for TODs lie in areas with active real estate markets, yet these are the very areas most likely to encounter political resistance to public land acquisitions. Consequently, transit agencies may be forced by circumstance to focus land acquisition activities on economically depressed areas, reducing opportunities to attract developers willing to partner with them, decreasing their financial gain from the sale of banked land, and placing them in the role of an economic development agency with the associated risks.

Sale or Lease of Development Rights

Identifying and promoting opportunities for the sale or lease of underutilized transit agency land for development can be an important precursor to TJD and TOD. Often, such entrepreneurship is pursued with the dual purpose of encouraging transit-supportive development near transit, thereby increasing potential system ridership, and also as a means to increase transit-agency revenues (Keefer 1984; Landis et al. 1991). One method is to

identify and sell parcels or portions of parcels owned by the transit agency that were acquired when the system was constructed, such as equipment staging areas, but are no longer in use. However, these opportunities may be rare and the parcels themselves may be small and unattractive to developers (Howard et al. 1985).

Currently, the long-term ground lease is the method most commonly used to facilitate TJD projects on transit agency properties. Ground leases appear adequate for some forms of development such as rental housing, but in general the financing complications and resulting higher transaction costs involved in forging these deals form a barrier to interested parties, particularly potential lenders. Fee-simple sales provide a more attractive option for non-rental commercial and residential development projects (Bernick & Freilich 1998).

Another option is the sale or lease of air rights. Often, the leasing of air rights is preferred over outright sale since a lease arrangement will allow the transit agency to maintain some level of control over the future use of the property. Other leasing possibilities include space within a station or terminal (e.g., concessions) and station-connection rights (e.g., station interface programs). Leasing may also allow a transit agency to renegotiate rent payments based on any future increases in property values (Howard et al. 1985).

In the case of Cedar Rapids's intermodal transit facility, described earlier, the public-sector developers (the transit and community development agencies) crafted a 50-year air-rights lease arrangement with the private sector for the 15-story office tower developer with three automatic renewals (National Council for Urban Economic Development 1989). In Santa Cruz, California, the Metropolitan Transit District leased retail and office space at its intermodal station south of downtown. The funds obtained from these deals have been used to offset the operations and maintenance costs for the $2.5-million facility (National Council for Urban Economic Development 1989). In Denver, the Regional Transit District (RTD) leased air rights over the city's Civic Center Transit Facility to a developer for $400,000 in each of the first 15 years plus 38 percent of the developer's profit after it first deducts a 13.5-percent return on its cash investment. Upon expiration of the lease, RTD will own the 600,000-square-foot office building.

The most remunerative air rights are associated with large rail systems. Atlanta's Metropolitan Atlanta Rapid Transit Authority (MARTA) receives nearly a half-million dollars each year in lease payments from owners of the Resurgens Plaza that sits above the Lenox station (Photo 5) while the Washington Metropolitan Area Transit Authority (WMATA) reaps over $2 million annually in air rights income from two projects alone—mixed-use buildings at the Bethesda and Ballston stations (Cervero et al. 1991; McNeal and Doggett 1999). Air rights over land adjacent to Miami's Dadeland South station were leased as a *quid pro quo*—in exchange for acquisition of the one-acre site for the station. The lease also requires the developer to share 4 percent of gross income with the rail authority over the 99-year lease period.

While most land and air rights leases occur at and around stations, many transit agencies have also entered into lease arrangements with telecommunications and electric power companies that allow fiber-optic and wide-band width cables to be strewn along rail transit rights-of-way. While such lease revenues provide much-valued revenues, because they are not related to station access points, they are thought to offer no advantages for leveraging TOD or TJD projects.

Photo 5. Air Rights Development at Atlanta's Lenox Station.

Since transit right-of-ways often overlap with state highway properties, it is useful for state DOTs to set clear policies that allow the use of state properties, as appropriate, for transit-oriented joint development projects. In California, the state DOT, Caltrans, is authorized to lease for up to 99 years the areas above, below, or any portions of their rights-of-way to the Los Angeles MTA for the purposes of accommodating railway alignments, intermodal facilities, or related commercial developments (White and McDaniel 1999).

IV.4 Supportive Public Policies: Zoning and Regulations

Local governments wield considerable influence over the type and character of land development that occurs around stations, principally through their vested home-rule and land-regulatory powers. This section reviews experiences with zoning, Planned Urban Development (PUD) classifications, specific-plan initiatives, and transfer of development rights (TDR) programs in leveraging TOD and TJD.

Zoning

Among the zoning initiatives used to promote TOD have been incentive zoning (e.g., density bonuses), performance zoning (e.g., tying incentives to meeting minimum criteria), inclusionary zoning (to encourage mixed uses), interim zoning (to prevent auto-oriented uses from precluding eventual TOD), floating zones (to allow flexibility in where desired uses go), and minimum-density (as-of-right) classifications.

In their survey of nearly 300 transit agencies in the United States, White and McDaniel (1999) found that the most commonly used regulatory techniques were mixed-use zoning, performance-based density bonuses, and rezoning to encourage transit-supportive land uses. Most zoning initiatives have focused on leveraging commercial development, mainly because such uses typically generate higher ridership and property tax receipts than housing projects. In a review of land uses near more than 200 existing and proposed rail stations in Southern California, Boarnet and Crane (1998B) found little evidence of zoning for residential TODs in local zoning codes. They inferred that, in Southern California at least, zoning for housing is viewed as less fiscally remunerative, thus conflicting with large economic development goals.

Incentive zoning involves providing rewards to developers for doing things that create public benefits. Incentives may take the form of density bonuses provided to the project in exchange for developer-paid improvements to public facilities. For example, the city of New York granted density bonuses as a *quid pro quo* in return for the developer financing passageway improvements to 51st and 63rd Street stations along the Lexington Avenue subway line (Photo 6) (Howard et al. 1985;

Photo 6. Privately Financed Pedestrian Access at Lexington Avenue Subway Station in New York City. The city granted the developer a density bonus in return for the improvement.

Cervero et al. 1991). Density bonuses have also been used by jurisdictions in far less dense transit settings, usually in hopes of stimulating ridership, including the city of Culver City (California), King County (Washington) Department of Transportation, and the Triangle Transit Authority in North Carolina (White and McDaniel 1999).

Performance zoning is similar to incentive zoning in that the land-use authority uses a system of rewards for developers to contribute toward a specified set of public benefits. However, in this case, the developer is required to design a project that meets a set of performance criteria that promote transit usage. In the case of Montgomery County, Maryland, development projects around Metrorail stations must be designed to reduce the number of single-person automobile trips below a pre-established ceiling. In exchange, minimum parking standards are relaxed (Howard et al. 1985).

Inclusionary, interim, overlay, and floating zones have common purposes—mainly to create a make-up of land uses that encourage transit usage and avoid the strip-commercial character of auto-centric landscapes. In Portland, Oregon, the city has instituted an overlay zone called the Light Rail Transit Zone. This designation encourages pedestrian-oriented development in LRT station areas, including small retail shops, restaurants, outdoor cafes, benches, and kiosks (Lefaver et al. 2001). Moreover, interim zoning was used during the planning and construction of Portland's Westside LRT corridor to prevent auto-oriented uses within a half-mile of stations, to set minimum densities, to cap parking supplies, and to control building placements to ensure efficient pedestrian access to and from stations (Arrington 2000). Partly because of these zoning classifications, the Orenco station has become a prototype for transit-friendly design in a traditionally auto-oriented suburban setting (Photo 7).

The city of San Diego has introduced a "floating" Urban Village Overlay Zone wherein developers can apply TOD principles to any site adjacent to a planned or existing Trolley station. The 4S Ranch project on the northern edge of the city was allowed to double the number of proposed housing units in return for a design commitment to a pedestrian-friendly TOD (Bernick and Cervero 1997). The city of Mountain View, California, has likewise established a combination floating-overlay zone called the Transit District, or "T" zone. Use of this designation is restricted to properties currently zoned for either industrial or commercial use and that lie within 2,000 feet of a rail transit station. When applied, the T zone allows mixed uses, higher floor-area ratios, and reduced parking requirements (Lefaver et al. 2001). Not all states allow the formation of floating zones; thus, in some areas, securing authorizing legislation is important in promoting mixed-use development near transit stations.

Photo 7. Orenco Station, Hillsboro, Oregon. Originally designated for a campus-style office park, planners introduced various zoning tools to create a mixed-use town center, complete with loft housing, and a variety of attached and detached housing productions, all within a convenient walk along a central promenade to Orenco's MAX light rail station.

As-of-right zoning allows uses and densities within designated zones that are transit-supportive, as-of-right and, importantly, shielded from political pressures to downzone. In 1978, Dade County, Florida, established a Rapid Transit Zone along the entire length of Miami's heavy rail system. The county had purchased excess land around stations prior to system construction in concert with the Metropolitan Dade Transit Authority, which is a department within Dade County government. In this way, the county in its role as land-use planner was able to implement as-of-right zoning that supported TOD, while the MDTA was able to purchase specific parcels near planned stations that could be used to leverage TJD projects (Price Waterhouse LLP 1998). Local governments can opt to use zoning regulations as a bargaining chip with developers as opposed to a hard-and-fast set of rules that govern land uses. In the process of forging development agreements between local government and developers, planners can bargain to improve the transit-oriented design and uses of a proposed development in exchange for the relaxation of zoning requirements and restrictions. For example, a Sacramento real estate consortium received a 30-percent reduction in required parking in exchange for contributing $250,000 toward light rail station construction (White and McDaniel 1999).

Planned Urban Developments

While most often used to implement auto-oriented development (AOD), planned unit development (PUD) can also be used for TOD. PUD often represents a zoning designation of newly master-planned communities and is used to control design and land uses at the individual tract level as long as parcels are in accordance with the

PUD ordinance. Therefore, as long as a PUD ordinance is established that supports the site designs and land-use mixes that are characteristic of TODs, it can provide local planning departments with more effective control over development than traditional zoning tools (White and McDaniel 1999).

San Jose, California, has successfully used the PUD designation to shape the location and design of several TODs near its light rail system stations. A good example is the Almaden Lake Village, a 250-unit residential complex completed in 1999 that was built on a former park-and-ride lot, adjacent to an LRT station. The PUD re-designation allowed for the zoning flexibility to slightly reduce the parking spaces from 1.7 spaces per dwelling unit, as required by the M-1 zoning in place prior to the PUD designation for the site, to 1.6 spaces per unit (Lefaver et al. 2001). Another notable parking-lot infill project with affordable housing components built under the city's transit-based PUD classification was Ohlone-Chynoweth. There, the PUD designation helped in creating a retail center, child-care facility, and library adjacent to the light rail stop.

Specific Plans

Specific plans set forth detailed specifications for how a particular area will develop and, as such, provide an opportunity for governments to control parcel-level land uses and design at a greater level of detail than most general plans and zoning ordinances. These advantages can be put to good use in encouraging TOD projects in transit-rich environs.

An example of the use of specific plans to implement TOD policies comes from Mountain View, California. Called "Precise Plans" by the city, the Whisman Station Precise Plan introduced land use and design standards for properties near this Silicon Valley light rail stop. The plan encourages mixed-use development and stipulates that residential units are to include small single-family lots and a range of low-rise and high-density townhouses. The design criteria further specify that multi-family housing complexes are to include enclosed bicycle storage facilities and direct pedestrian access to the nearby light rail station (Lefaver et al. 2001).

Transfer of Development Rights

Under this approach, landowners can trade unused development rights to other parcels in return for income, allowing densities to be stacked up higher near transit stations than they would be otherwise. If a property is developed below its maximum allowable density according to the zoning code, the unused density can be sold or traded to another property, allowing the receiving property owner or developer to exceed the density limitations of their site. In Toronto and New York City, transfer of development rights (TDR) have been used to achieve the twin objectives of targeting growth to transit station areas and preserving historical properties that might one day be razed to make way for more profitable commercial development (Urban Land Institute 1979; Cervero 1998A).

As a tool for jointly promoting TOD and historical preservation, a transit station is designated a TDR "receiving area" and heritage and other low-density parcels are designated as "sending areas." For the land-owner, TDR provides fair compensation for rights relinquished through zoning laws. In a recent national survey of transit agencies, White and McDaniel (1999) recorded the use of density transfers and transfers of development rights only for Portland Tri-Met, in King County, Washington, and Raleigh's Triangle Transit Authority.

Canada has a much stronger tradition of TDR applications in the transit field (Pucher 1994; Cervero 1998A). While Toronto and Montreal aggressively applied TDRs 30-plus years ago, even today one finds cities like Ottawa and Vancouver using TDRs to funnel development to station areas. Vancouver's BC Transit, which owned much of the original right-of-ways for the SkyTrain project, sold most of the land underneath aerial tracks to private investors. TDRs allowed landholders to shift development rights to station areas. Under this arrangement, BC Transit gained revenues and the region at-large benefited from TOD.

IV.5 Supportive Public Policies: Complementary Infrastructure

Complementary public improvements, like sidewalks, landscaping, and undergrounding of utilities, can spur private-sector investments (Knight and Trygg 1977; Witherspoon 1982). Government grants can be used to upgrade infrastructure, improve connections between stations and surrounding neighborhoods, and generally spruce up the immediate area around a transit facility.

Upfront public investments are especially critical in inner-city areas. Before private capital will come to depressed urban districts, substantial improvements are often necessary not only to enhance a neighborhood's appearance and capacity for growth but also to demonstrate a *bona fide* public commitment to turning an area around. At Pleasant Hill, a semi-rural area when BART first arrived nearly three decades ago, the redevelopment agency installed new drainage and water systems and placed utilities underground — along with assembling land, creating a specific plan, and issuing tax increment bonds — to jump start private-sector investment. In San Diego, redevelopment agencies have successfully attracted growth to transit stations in La Mesa and the Centre City by enhancing local infrastructure (using tax-increment financing) as well as assisting with land assemblage (Photo 8). The Metropolitan Transit Authority (MTA) is today seeking to leverage TODs in Southern California by pledging money for such public improvements as parkland, pathways, landscaping, and street-lighting upgrades (Still 2002). Federal grants have also gone to improving walkway connections to transit stations in many parts of the United States.

Photo 8. Housing Development in Central-City San Diego, Adjacent to the San Diego Trolley Light Rail Transit Line. Nearby public improvements, including redevelopment of the historical Gas Lamp district, have attracted middle-income households to in-city mid-rise housing projects near Trolley stops.

IV.6 Supportive Public Policies: Procedural and Programmatic Approaches

Another set of implementation strategies pertains to procedures and non-land-use programs that can be put into place to

promote TOD and TJD. While some bold measures, like peak-hour road pricing, would perhaps do more than anything else to bring about mid-rise, mixed-use development oriented to transit over the long run, only initiatives that have gained a political foothold in the United States today are outlined in this section, notably the streamlining of development reviews, remediation, resource sharing, siting of public facilities, and travel-demand management initiatives.

Streamlining Development Review

Real estate developers often complain about the unpredictability and arbitrariness of the project review process. The development process can be an obstacle course of obtaining permits from local authorities and adhering to a long list of environmental requirements. A policy of fast-tracking the review and approval of projects within TODs can be a strong attraction to developers who have experienced firsthand the entanglement of red tape. According to the lead developer, the 86-unit Atherton Place project near BART's Hayward station owes its existence in large part to the local redevelopment authority, which expedited the project through the city bureaucracy.

Streamlining can also be achieved through entitlements—e.g., giving TODs priority in the queue for permits (e.g., sewer or water permits), automatic approval of concurrency requirements, as-of-right zoning, or exceptions from environmental review. For example, by preparing a transit village plan and simultaneously modifying the general plan for an area and the zoning code to bring them into conformity with the plan, developers whose proposals conform to the plan can be exempted from a lengthy permit review process and environmental-impact assessment requirements (Cervero 1998B).

Streamlining can also be done through the dedication of staff and planning resources from transit agencies and local governments to the facilitation of TJD and TOD. In a series of interviews with professional staffers working on TOD projects in four metropolitan areas, Ohland (2001B) makes several recommendations on how TOD projects might be expedited:

1. The pre-approval of station-area parcels for TOD development;

2. The development of a set of prototype TOD plans that could be used at different station areas;

3. The development of a list of financial institutions familiar and comfortable with lending for mixed-use, high-density, and reduced parking projects;

4. Increased funding for pre-development work, including the creation of master environmental impact reports that could help streamline the approval process and allow TOD developers to skip the expensive and time-consuming environmental impact review (EIR) stage; and

5. The dedication of city, transit agency, or other government staff to "shepherding" TOD projects through the myriad local pre-development requirements. The city of Portland, Oregon, has been particularly generous in providing professional staffers who work on land assemblage and on putting projects together.

Remediation

Many transit lines across the United States are located along old railroad right-of-ways flanked by aging industrial properties and

brownfield sites.[17] While land tends to be plentiful in these corridors, developers face potentially costly bills for clean up and site remediation. Nonetheless, such parcels offer tremendous opportunities for forming new TODs and breathing life into once moribund industrial belts.

A good example of remediation and brownfield redevelopment is EmeryStation Plaza, a 10.5-acre mixed-use TOD anchored by an Amtrak station (Photo 9). The site, formerly used for heavy industrial purposes, is slated to become the new town center for Emeryville, California (Parsons, Brinckerhoff, Quade and Douglas 2001B). Emeryville had long wanted an urban center, but the absence of a BART station for channeling growth and the omnipresence of super-block industrial complexes thwarted such efforts. Amtrak's decision to open a new station between downtown Oakland and Berkeley provided the opportunity that had been waited for to create a community hub. The city of

Photo 9. Brownfield Remediation: Emeryville Town Center at Amtrak/Capital Corridor Commuter Rail Station. Several prominent high-technology firms have moved into modern office complexes within an easy walk of the Emery Amtrak station and emerging town center.

[17] Besides transportation grants, other funding sources for rehabilitating brownfield sites include the Brownfield Economic Development Initiative (BEDI) grants and Section 109 loans, both administered by the U.S. Department of Housing and Urban Development.

Emeryville coordinated with the developer, Warehem Properties, to develop the site, which had been vacant for 20 years. The availability of site clean-up funds was critical to funding the project. The project adaptively reuses several old industrial buildings that are blended in with new office, retail, and residential construction. Approximately 150 units in owner-occupied loft and town home developments, as well as a senior housing project, have been constructed. At build-out, the investment in the EmeryStation Plaza is estimated to total $200 million (Arrington and Parker 2001).

Resource Sharing

A programmatic approach to drawing private capital to transit station areas is to offer economies of scale and scope through sharing resources. Sharing assets and resources can range from a transit agency and developer jointly using staging areas for construction equipment to joint sharing of heating and ventilation systems (as practiced at WMATA's Farragut West Station).

One natural example of resource sharing in TOD settings is parking. The sharing of park-and-ride lots with nearby entertainment complexes can generate revenues to transit properties and entice new commercial investments by increasing profit margins (especially in urban settings where structured parking can run $25,000 or more per space). In San Diego, the regional rail authority, MTDB, entered into a license agreement for parking with a theatre owner to share the transit agency parking lot at the Grossmont Station.[18] For use of the parking lot, the theatre pays MTDB an annual lease. Theater-goers can use the parking lot at all hours, subject to the same limitations as Trolley patrons (e.g., no parking over 24 hours).

Stations themselves can also be valuable assets. Their attraction to potential retail tenants is the ready-made base of customers passing through or idly waiting for trains. All U.S. rail systems lease common space under concession agreements, such as for newspaper kiosks. Some have gone further than others in sharing station space, pursuing cooperative renovations in return for free or heavily discounted leases. Under its "Lease and Maintain Program," the Southeast Pennsylvania Transportation Authority (SEPTA), serving the greater Philadelphia region, offers rent credit to private developers who lease commercial space within rail stations in return for developers making specified capital improvements (Landis et al. 1991). When it decides to renovate a station, the agency issues an RFP and awards a concession lease to the highest bid, which on the one hand ensures the highest returns but on the other hand constrains the agency's ability to negotiate project specifics (e.g., design standards, preferred uses, and maintenance responsibilities). Also, since SEPTA must conform to local zoning laws at all of its stations, proposed commercial projects and station renovations in residentially zoned areas have been denied by local governments due to neighborhood opposition. For this reason, most projects built to date under the Lease and Maintain Program have been small, neighborhood-scale retailers or eateries.

Siting of Government Facilities

Federal, state, and local governments can promote TOD through facility siting and parking programs. By making commitments to locate government offices near transit stops and remove parking subsidies (e.g., through cash-out initiatives), governments boost transit ridership and create a base of workers

[18] San Diego Metropolitan Transit Development Board, "License Agreement for Parking," April 19, 1990, between the San Diego Metropolitan Transit Development Board as Licensor and CCRT Properties as Licensee.

that attract private investors (e.g., restaurateurs, shopkeepers, hoteliers).

In the Washington Metropolitan area, the U.S. General Service Agency (GSA) has made proximity to transit a requirement of all future federal government buildings located within WMATA's service jurisdiction. At Arlington's Ballston station alone, this policy helped to attract the National Science Foundation, the National Pollution Control Center, the U.S. Army Legal Services Agency, the Federal Deposit Insurance Corporation, the Applied Research Planning Agency, and the National Rural Electric Cooperative Association. In California, a state law requiring state office buildings to be located "within a quarter-mile of average or above average transit service" is thought to have had a stronger influence on transit-oriented growth in the Sacramento region than any single policy (City of Seattle 1999). In Portland, a number of large public investments in the Lloyd district have created employment and regional entertainment centers near the MAX line, including office buildings for the Bonneville Power Administration and the state of Oregon, the Oregon Convention Center, the Rose Garden arena, and new headquarters for the Metro regional government (Arrington 1996).

Transportation Demand Management

Policies that promote alternative modes of travel and manage parking demands, generally known as transportation demand management (TDM), can be important complements to TOD initiatives. The well-known Land Use Transportation Air Quality (LUTRAQ) study[19] demonstrated that land-use policies alone often have little impact on travel outcomes, but when combined with TDM initiatives they can exert meaningful influences. Using state-of-the-art modeling techniques, the LUTRAQ study tested a scenario that assumed employees would be charged for parking if they drove to work and would receive a free ride if they commuted by transit. Incorporating these TDM assumptions resulted in a 14-percent decline in total vehicle miles traveled (VMT) and a 14-percent gain in transit mode shares of all trips (Giuliano 1995).

Air-quality mandates are often behind parking strictures. In the early 1990s, the South Coast Air Quality Management District passed Regulation XV, which stipulated that no more than half the number of parking spaces called for under parking codes could be built for new office buildings in downtown Los Angeles (Gilson and Francis 1993). Although these and other trip-reduction requirements were repealed in 1995, the presence of high-quality rail services, coupled with programs like cash-out, have prompted some developers of mixed-use projects along the Wilshire corridor and in the Hollywood district to recently opt for parking supplies below market norms.[20]

In Portland, the violation of carbon monoxide standards was a decisive factor in prompting leaders to employ TDM parking strategies in downtown. In particular, the city of Portland has replaced minimum parking standards with maximum parking limits. Downtown

[19] In 1992, the Land Use Transportation Air Quality (LUTRAQ) connection study was commissioned by Oregon Department of Transportation with support from the advocacy group 1000 Friends of Oregon. It was intended to evaluate the land use and transportation impacts of building a major bypass on the western side of the Portland Metropolitan region compared with the impacts of pursuing compact, transit-oriented urban development, utilizing strict land use controls and investments in light rail (Cambridge Systematics et al. 1992).

[20] In California, legislation now requires large employers who subsidize employee parking to offer their workers a cash equivalent to the cost of renting a parking space. Employees can take either the space or the cash, thus eliminating a built-in bias that favors driving.

buildings fronting Portland's bus mall are zoned for the lowest ratios (0.7 spaces per 1,000 square feet of floorspace) and those farther away have higher ratios (up to a maximum of two spaces per 1,000 square feet). Since 1984, there have been no recorded carbon monoxide exceedances in Portland's core (Cervero 1998A). These changes have been credited with having bolstered TOD downtown and around several eastside MAX stations (Arrington 1996).

In Sacramento, the city's parking management program has been voluntary, allowing employers to opt for TDM measures, like transit pass subsidies, in exchange for reduced parking requirements. So far, this program has not attracted many takers, suggesting reduced parking incentives may not be sufficient to induce TOD (City of Seattle 1999).

IV.7 Use of Value Capture

While usually viewed as a revenue source, recapturing the value added from capital investments in transit can also be an important implementation tool—in the sense that income receipts can go toward the many kinds of upfront, ancillary improvements (e.g., landscaping, civic spaces, pathways, and lighting improvements) that can be absolutely essential toward jump-starting a TOD. As discussed earlier, parcels surrounding transit stations gain value because they enjoy better connectivity to the region—i.e., residents can more easily and conveniently reach jobs, shops, and other destinations; more potential shoppers pass by retail outlets; and for businesses, the laborshed of potential workers is enlarged. Transit stations function as gateways between a neighborhood and the region at large. Value capture is about the public-sector sharing—indeed, recouping—some of the value added.

Value capture can take many forms, some more direct (e.g., benefit assessment, value-added taxes, and land-banking) than others (e.g., ad valorem property taxes and tax increment financing). Historically, the U.S. transit industry has applied direct measures of value capture sparingly (Harmon and Khasnabis 1978; Callies 1979). In Europe and Japan, value is typically recaptured from transit investments through assembling and banking land on the open market, waiting until market conditions are ripe to reap a return on investment (Cervero 1998A).

The most prominent form of value capture in the United States is the use of benefit assessment districts. Miami's Metromover downtown circulator, for example, was partly financed through a special assessment levied against benefiting downtown properties. Hook-up fees assessed to developers or owners of structures adjacent to transit stations (e.g., through joint plaza areas or knock-out panels) are another form of tapping into values created by public investments. WMATA pioneered this approach through its "station connection fee" program. The first connector agreement was with the Woodward and Lothrop ("Woodies") department store, which saved the agency $250,000 in construction costs for a passageway between the Metro Center concourse and the retailer's mezzanine level. WMATA was granted a permanent right-of-way easement at 50 percent of fair market value, saving an additional $255,000 (Miller 1993). Seattle Metro and Atlanta's MARTA have similarly received cash payments from downtown retailers to finance passageway connections. In the case of Atlanta's Five Points station, the F.M. Rich department store not only funded the construction costs, but also pays an annual connector fee and covers the costs for maintenance.

In a survey of transit agencies and their experiences with TJD projects, Howard (1988) found that agencies that were most

successful at coordinating transit services and surrounding land uses and in working with the private sector have incorporated the philosophy of benefit sharing and value capture into their organizational ethos. These entrepreneurial-minded agencies were successful at reaching beyond their traditional roles as transit service providers to incorporate real estate development activities that focused on providing monetary and ridership benefits to the transit agency. They were able to establish a cooperative process between their own agency, private property owners, local planning and development agencies, and elected officials.

As opposed to other forms of benefit sharing, like TJD (where the transit agency encumbers direct financial risk for a commercial development), value capture offers a financial return more or less free of risks (save for possible lawsuits contending a violation of *rational nexus* requirements). The costs can be stretched out over time, as opposed to a joint development or wholly transit-agency-funded development near a station, which requires significant upfront costs and entails financial risk for the transit agency involved (Callies 1979; Howard et al. 1985).

Value capture invariably raises issues of legitimacy— i.e., should transit agencies be involved in real estate matters? One evaluation found that perhaps the most important factor in determining success at value recapture is the level of support from the general manager and transit board to "broaden the scope of transit agency activities beyond operational concerns to include land use and development" (Howard et al. 1985, p. 2). Also important are an "entrepreneurial spirit," the existence of in-house real estate expertise, and a desire to cooperate and build partnerships (Landis et al. 1991).

WMATA is a textbook case of an entrepreneurial agency that recognized early on that it could recoup part of its investment costs by sharing in the value added to land by transit. Value capture is a core principle of the organization. As of 1999, WMATA's 24 joint development projects were generating nearly $6 million in annual revenue and an estimated $20 million in increased property taxes to localities (McNeal and Doggett 1999).

The new federal joint development rulings are enticing more transit agencies to be entrepreneurial, recapturing value through direct land sales. The Metropolitan Atlanta Rapid Transit Authority (MARTA) is today following the WMATA model and exploiting the new federal rulings to do so. In 1997, when the new federal rules were issued, MARTA responded by issuing a request for proposals for transit-supportive development on a 50-acre site at the Lindbergh station. The agency realized that excessive traffic conditions had made their property holdings around the station extremely valuable. After hard-fought negotiations with local residents opposed to infill development, a large-scale mixed-use project, called Lindbergh Center, is moving forward, with BellSouth occupying the majority of office space. MARTA was able to utilize income from the sale of excess properties, approximately $40 million, to finance parking within the project site (Chambers 1999). The agency expects to make a return of about 10 percent on their investment, including parking fees. MARTA is partnering with Carter and Associates, a local developer, to build the Lindbergh Center project, with the agency contributing the land for parking structures while Carter and Associates shepherds the project through the development and construction phase.

The promise of recapturing value also extends to private investors, such as in the case of Portland's Airport MAX extension. There, Bechtel Enterprises is contributing more than $28 million toward the $125-million light rail project. In return, Bechtel, in partnership with the real estate syndicate, Trammell Crow, will develop a 120-acre TOD, called Cascade

Station, with office, retail, and hotel uses at the entrance to the airport, hoping to more than recoup the company's contribution to financing the light rail extension (Parsons, Brinckerhoff, Quade and Douglas 2001A).

IV.8 Long-Range Planning

While the implementation tools described so far are vital to the creation of TOD and TJD projects, their success depends in part on the degree to which they are embedded within a larger comprehensive transportation and land-use planning process. Absent comprehensive planning, TOD is apt to occur piecemeal, or worse yet take the form of one or two islands of transit villages in a sea of auto-oriented development.

Ideally, a visionary and comprehensive planning process would be underway at the time a transit system or its expansion components are being planned. At this point, individual growth corridors and TODs could be identified and the appropriate land-use plans and tools can be formalized and approved within the political process. During the alternatives analysis and draft environmental impact statement development stages, corridor master plans should be worked out. At this stage, various growth nodes can be designated, and appropriate land-use regulatory strategies and financial tools for individual station areas can be selected. The idea is to send clear and unequivocal signals to the private sector about how the transit system and supporting land-use plans will join forces in achieving a long-term regional development vision. To date, the Portland region—aided by the existence of a regional governing body, Metro—has come the closest to applying these bedrock planning principles. The emergence of viable TODs, like Orenco, are a testament to the importance of good regional planning in orchestrating community-scale development. Other U.S. cities, like San Diego and Minneapolis, are currently following Portland's example. Under the direction of the San Diego Association of Governments (SANDAG), the San Diego region has adopted a policy of targeting growth to transit-focused areas (see box below). Regional policies call for the bulk of countywide growth to occur within a half-mile of light rail and commuter rail stations.

A generic strategy to comprehensive station-area planning, recommended by Howard (1988), is a "tier system." Here, neighborhoods surrounding transit nodes are divided into "growth" and "limited growth" categories. Tiers within the growth category are commonly designated as "urbanized or planned urbanizing," while tiers in the limited growth areas are categorized as "rural/future urbanizing," "agricultural," and "future open space." While most zoning regulations describe intentions for future land uses, these designations send unambiguous signals to the private markets about the intended, shape, use and character of these areas.

IV.9 Barriers and Constraints

Barriers to TOD and TJD fall into three groups: *fiscal* (factors that detract from the financial feasibility of TOD and TJD projects, such as questionable market viability and lack of conventional financing); *organizational* (structural impediments lodged in the institutional fabric of transit agencies and other governmental entities responsible for projects); and *political* (land-use policies and

TOD-Friendly Growth in San Diego County

San Diego considered a stringent approach to growth management but quickly realized a different strategy was needed after voters, in 1988, resoundingly rejected a flurry of citizen-ballot initiatives mandating caps on building permits and bans on large-scale development. However, Proposition C, an advisory measure, did pass. The proposition called on San Diego County and its 19 cities to prepare a regional plan that would resolve cross-border problems related to transportation, air quality, solid waste management, and unplanned growth. Based on long-range projections that showed that historical growth trends were unsustainable, a regional plan was prepared that called for a future of compact growth oriented to transit. Instead of heavy-handed growth controls, however, it was agreed that incentives, like density bonuses and targeted infrastructure improvements, would work best. The city of San Diego took the lead by developing TOD guidelines that called for compact, mixed-use, and pedestrian-friendly patterns of development around light rail nodes. A performance-based land guidance system was also introduced that aimed to mitigate the negative effects of growth while allowing the marketplace to determine the best use of individual properties. The system allows any activity on a piece of property provided it is compatible with neighboring uses and satisfies larger community goals. City planners use a point system to assess whether this is the case. Criteria reward infill projects and redevelopment, especially near Trolley stations. The regional planning body, SANDAG, had adopted a "land use distribution element" as part of the regional growth management strategy that calls for targeted infrastructure investment and zoning policies that promote growth in transit-focused areas. The Mission Valley light rail line was developed with TOD objectives in mind, culminating in the emergence of mixed-use projects like the Hazard Center. *Sources*: Dunphy (1997); Cervero (1998A).

SANDAG's Transit-Focused Areas Hazard Center, Mission Valley Line

Barriers to TOD and Legislative Relief

As part of its campaign to promote transit reinvestment investment districts in Pennsylvania, the Southeast Region Pennsylvania Environmental Council identified possible stumbling blocks. Based on a survey of TOD activities associated with 11 U.S. and Canadian transit systems, 17 barriers to TOD implementation were identified, broken down by the institutional bodies most able to cope with the problems:

State

1. Lack of concurrency between transportation and land use decision making
2. Lack of understanding of TOD benefits
3. Deficiencies in land condemnation powers

Municipalities/Counties

4. Lack of TOD supportive zoning
5. Lack of TOD opportunity identification
6. Lack of land acquisition authority
7. Ignorance about TOD benefits (as at the state level)

Transit Authorities

8. Limited ability to provide high service levels
9. Lack of funds
10. Lack of transit authority commitment
11. Limitations on joint development capabilities
12. Station area constraints, like poor access and scarcity of land
13. Complex station ownership

Development Community

14. Lack of demonstrated market demand
15. Difficulty of partnering with transit agency
16. Lack of TOD zoning and development opportunities
17. Lack of TOD lending policies

TRID to the Rescue

The proposed transit reinvestment district (TRID) legislation would create a binding partnership between localities and transit authorities so as to overcome many of these barriers. This would include the formulation of station area plans, community outreach, and TOD-supportive zoning. The proposed legislation would also expand a transit agency's land acquisition authority and eminent domain powers for purposes of pursuing TOD. As was attempted in the original formulation of California's Transit Village Act, proponents hope that legislation would extend redevelopment powers to include non-blighted neighborhoods well served by transit and prime for TOD.

Source: Starr (2001)

"not in my backyard" [NIMBY] forces that impede multifamily housing and infill development more generally). For specific studies on the barriers to TOD, see Deakin et al. (1992); Cervero et al. (1994); and Boarnet and Crane (2001).

In a study of 13 transit agencies across the United States, the Sedway Kotin Mouchly Group (1996) found that many of the barriers to TJD projects were impediments to TOD projects as well. The authors concluded that if fiscal, institutional, and political barriers are not removed, at least in part, then costly rail investments across the United States will fail to generate sufficient ridership and reap the returns on investment that were promised to taxpayers.

Fiscal Barriers

The high costs of supporting infrastructure — e.g., sidewalks, improved street lighting, expanded sewer and water capacity, signalization upgrades — often form significant barriers to TOD. The questionable financial viability of TODs can make it difficult to secure commercial loans. In the stiff competition for transit development grants, neighborhood enhancements around transit stations are often a low priority. The higher construction costs, development fees, and risks associated with denser housing and commercial projects also form financial obstacles. In California, a series of lawsuits holding condominium builders liable for faulty construction as late as 10 years after units were sold has discouraged some developers from pursuing the high-density housing market altogether.

Boarnet and Crane (1998A) contend that fiscal zoning thwarts efforts to promote housing production around rail stations and the lack of a permanent residential population prevents TODs from taking form. Their study of 232 rail stations with commuter rail and light rail services in Southern California provides empirical evidence of this. In general, California municipalities heavily reliant on sales tax and property tax proceeds were found to have high shares of citywide commercially zoned land within quarter mile rings of rail stops.

In the case of San Francisco's BART, the Sedway Kotin Mouchly Group (1996) recommended that the transit agency address this issue by creating incentives for the construction of high-density residential housing near BART stations. One approach would be to support legislation similar to Oregon's House Bill 3133 that would allow local governments to grant property tax abatements for multi-family housing built near transit. The recent creation of regional and sub-regional housing incentive programs (HIPs) has also been a positive step.

Perhaps the most challenging TOD and TJD projects to implement are those located in economically stagnant areas. While there are a host of public and private institutions set up to provide financing for affordable residential developments in such areas, there are few parallels for commercial development. In the case of San Diego's Barrio Logan neighborhood, efforts to create a mixed-use development have been successful on the residential side, but the project managers have struggled to find financing for the commercial development that will agree to a TOD plan. The developer's ability to obtain financing was severely hampered by its inability to attract an anchor tenant for the project. As long as the developer is able to provide loan guarantees, banks typically loan up to 70 percent of the money for shopping center development. The anchor tenant typically provides the loan guarantees for the project in which it promises to continue paying rent on their space even if the business at that site fails. Without an anchor tenant, banks are

usually unwilling to provide loans (Ohland 2001A).[21]

Similar difficulties have been encountered among non-profit/affordable housing groups trying to build TOD and TJD projects on transit agency land in the San Francisco Bay Area. Since lenders often require the ownership of land being built upon to be put up as collateral to secure the project loan, financially strapped non-profit housing builders must often make concessions to lenders in terms of project design. In the process, the delicate details of good transit-oriented design may be sacrificed in order to satisfy the lending institution (Ohland 2001B).

While San Diego's Barrio Logan project has been successful at building residential units near transit, Atlanta has had some difficulties attracting residential development near its MARTA stations due to the high demand for office development there. Consequently, while there is a great deal of dense development around MARTA stations, it is mostly suburban-style office towers with lots of parking and poor pedestrian connectivity to nearby stations. This "dysfunctional density" is in part a result of density entitlements provided by the zoning code, which have increased property values in station areas. Since property values are so high, only high-value office and retail developments are financially feasible. These fiscal pressures result in "monocultures" of high-end office or retail that must draw on large market areas that are not easily served by transit, placing automobile site access above transit accessibility (Ohland 2001B).

Political Barriers

To many residents, transit-based housing and infill office development carries with it the specter of increased congestion, more crowded schools and grocery lines, the prospect of low-income households moving in, and an overall tarnishing of a neighborhood's image. This is especially the case in cities like Philadelphia, Chicago, and Boston, where older rail systems are surrounded by established neighborhoods that resist change.

NIMBY opposition has stopped mixed-use, infill development near rail stations in Oakland (Webber 1976), Miami (Salvesen 1996), and most likely every U.S. city that has built rail systems over the past century. Made weary by the prospect of additional traffic generated by the planned mixed-use development at Atlanta's Lindbergh station, a neighborhood group has filed multiple suits against MARTA to block construction. While the project is moving forward, these suits have set the project behind schedule. Because of community pressures, the 512 housing

[21] Fortunately, since the retail portion of the Barrio Logan project qualified the lender for Community Redevelopment Act credits toward state-mandated minimum investments in economically depressed communities, the bank was willing to provide the loan without an anchor tenant willing to guarantee the loan (Ohland 2001A). The character of the Barrio Logan shopping center will be decidedly suburban in design, making it more of a "transit-adjacent" rather than a "transit-oriented" development. Due to the eagerness of the lending institution and the redevelopment agency to begin construction and start the sales tax revenues rolling in, the city's TOD planning guidelines are being overlooked in favor of suburban strip-mall development. The community and the developer have compromised at 3.5 parking spaces for every 1,000 feet of retail space — well above the 2 spaces recommended by the city's TOD guidelines but well below the suburban standard of 5 spaces, which is what the developer wants. While the site currently has a street running through its center — a feature that could be useful as a conduit for pedestrian site access — the current plans require its removal. More worrisome, current designs call for the grocery store to turn its back on another main street adjacent to the site, and locate truck delivery bays facing the trolley station. Consequently, it seems that fiscal pressures not only cause private institutions to press for suburban, auto-oriented development, but also pressure public institutions to do the same.

units recently built near Santa Clara County's Whisman light rail station—"representing the biggest housing development Mountain View has seen in at least 20 years"—contained no rental units and were built at less than half the density originally proposed (Inam 2001, p. 24). While the addition of 500-plus units near the Whisman station might be considered a success by many, Inam (2001, pp. 26-27) views it as a promising TOD co-opted by NIMBY resistance:

> The developers proposed a high density project because they perceived that there was a demand for that number of units on this site. Now, the 500 families who might have been housed through the original density have not only had their residential choices further reduced, they do not even realize that they have reduced choices because their units were never built. Furthermore, the component of rental housing was eliminated, such that individuals and families who cannot yet afford to purchase a house or prefer the flexibility and convenience of rental housing have no option to do so, especially along a transit line. So, the demand for alternative development continues unmet thanks to projects like Whitman Station.

TOD coordination between transit agencies and localities can be especially difficult in areas with strong traditions of small, independent governments, like greater Philadelphia, where several hundred municipalities govern land-use matters via local zoning. Similarly, successful TJD and TOD projects often require changes in thinking and organization within the governmental agencies involved in the process. Struggles over turf and resistance to change within public agencies are legendary and present major obstacles to effective project implementation (Greater Bridgeport Transit District 1985).

Political barriers often arise between different factions of the transit-riding population as well. Often, the suburban stations of fixed rail systems have been constructed with large park-and-ride lots surrounding them, catering to riders with automobile access rather than encouraging the construction of multi-family residential units and attracting walk-on users. Park-and-ride patrons often have staunch supporters within agencies, creating barriers to the transformation of park-and-ride lots into transit-supportive developments. Efforts to reduce parking supplies invariably incite vocal protests, especially in built-up settings where curbside parking is in short supply.

These political fault lines have both fiscal and physical consequences. In the San Francisco Bay Area, BART's policies protect the park-and-ride patrons by requiring the one-to-one replacement of any surface parking that is removed for the purposes of development on BART land. Consequently, only those projects able to produce sufficient revenues to cover the costs of replacement parking get the green light to proceed. In practical terms, this means that ground-lease income must equal or exceed the costs of debt service for a parking structure.

The hard-line taken on parking can further deter TODs by creating a built-form that is hardly conducive to pedestrian access. Broad expanses of surface parking separate stations from surrounding neighborhoods and create an urban landscape that encourages people to flee transit stations as quickly as possible.

Organizational Barriers

Often, the degree to which a transit-oriented project is considered a success or failure is determined by the degree to which it is financially self-supporting, increases ridership and farebox receipts, and meets expectations in terms of schedule and facility improvements. In Miami, Atlanta, and other rail cities, transit agencies have "gotten the short end of the stick" when dealing with business-savvy, seasoned developers who

know how to negotiate a favorable deal (Price Waterhouse LLP 1998).[22] Bad experiences have at times turned transit board members against potentially lucrative TJD deals when opportunities availed themselves.

In the case of WMATA, years of TJD experience has resulted in lease agreements that provide the agency with legal and financial protections. WMATA's initial lease terms vary from 50 to 60 years, with an option renewal to a 99-year term. Rent is guaranteed, even if the developer declares bankruptcy. The rents also "bump up" when surrounding properties increase in value. Consequently, WMATA stands to benefit from increases in land values that may occur after a lease with the developer is invoked (Price Waterhouse LLP 1998).

The structure of the land development agreement for MTDB's Dadeland South project also proved problematic from the developer's perspective. Since the land for the project was leased to the developer and the county retained the property's rights of ownership, the developer needed to comply with government equal opportunity laws, adding to costs. The process of putting together a standard lease following Disadvantaged Business Enterprise and other government requirements can also be time-consuming (Price Waterhouse LLP 1998).

[22] Cushman (1988) recommends that transit properties entering into lease agreements insist on contractual language that ensures a percentage of gross revenues from the development, not net revenues (profit). Since accountants have a number of creative ways to calculate costs so that a venture never shows a profit on paper, the public entity needs to protect itself and its revenue stream with contractual language that has very little "wiggle room."

V. URBAN DESIGN

Numerous principles and normative approaches to designing TODs have been advanced. For the most part, they embody many of the same design elements found in the neo-traditional and New Urbanist movements, like moderately high densities, gridded street patterns, mixed land uses, convenient and safe walkways, varied housing products, civic squares, and priority to non-automobile forms of mobility. In ways, TOD is the application of neo-traditionalism to transit station areas (Calthorpe 1993; Bernick and Cervero 1997; Calthorpe and Fulton 2001; Duaney et al. 2001).

Peter Calthorpe, a California-based planner and urban designer, has pioneered much of the thinking on how TODs are best designed, though some note the roots of all contemporary TOD designs lie in Ebenezer Howard's celebrated writings on "garden cities" of over a century ago (Bernick and Cervero 1997). In his provocative book, *The Next American Metropolis: Ecology, Community, and the American Dream*, Calthorpe (1993) conceptualized TODs as transit-served neo-traditional communities. Rather than stand-alone nodes, however, Calthorpe viewed TODs as a constellation of co-dependent centers inter-linked throughout a region by high-capacity fixed-guideway transit services (Figure 5).

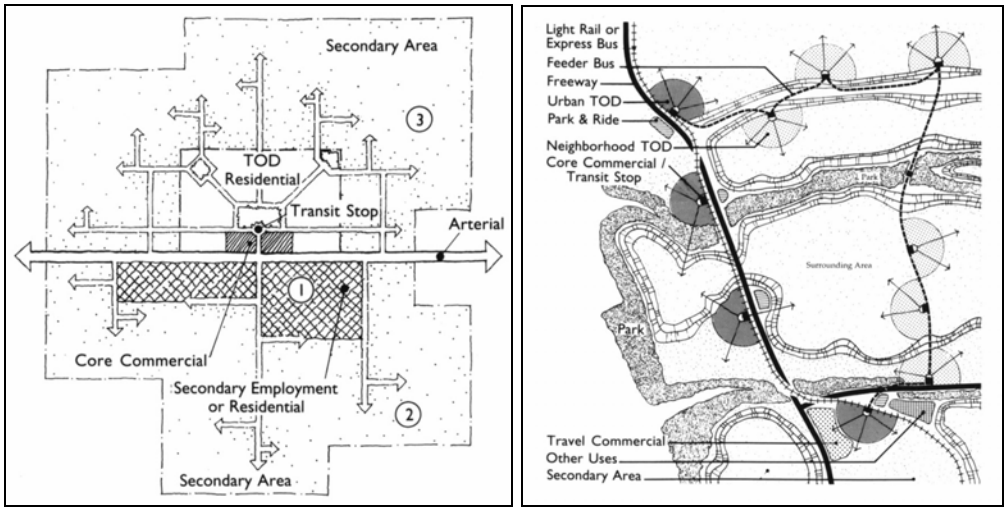
When it comes to design matters, transit agencies have not traditionally focused at the scale of TODs or TJD projects. Rather, design has been thought of at the street-scale level. Most large U.S. transit agencies have adopted design guidelines that promote subdivisions and neighborhood plans that make it easier for buses to operate and passengers to patronize transit (Cervero 1993B). Some agencies, however, are beginning to think at the scale of TOD or TJD projects. Ewing (1997) found that approximately 50 manuals on TOD are available in North America.

V.1 Community Service Integration

Many contemporary urban and suburban corridors are characterized by haphazard development, uninspiring streetscapes, and poor connections between residential neighborhoods and transit corridors (Calthorpe 1993; Loukaitou-Sideris 1993; Duaney et al. 2001). TODs offer an opportunity to revitalize decaying neighborhoods through the transit station's role in stimulating economic activity, improving safety and security (partly from a 24-hour per day presence of full-time and community-active residents), and coalescing residents around the common goal of neighborhood betterment.

TODs are partly about strengthening the bond between a transit service and the immediate community it serves. There can be direct transportation benefits from integrating transit and community services as well. Given the steady increase in trip-chaining, placing child-care centers at or near rail can induce some working moms and dads to patronize transit if they can easily consolidate trip ends—e.g., drop off the child at the day care and conveniently hop aboard a nearby train to get to work. In San Diego, a half dozen or so Trolley stations currently have child-care centers within several blocks of their platforms. Santa Clara County's Tamian commuter rail/LRT station features a day-care center directly on site.

Grass-roots initiatives and proactive neighborhood involvement are essential to bringing about positive community change. TODs (such as Fruitvale Transit Village in Oakland's Fruitvale district) are being seized



TOD as a Walkable Scale Community TOD as Part of a Regional Network

Figure 5. Calthorpe's Conceptual Design Schemes for TODs: Local and Regional Contexts. *Source:* Calthorpe (1993)

upon as opportunities for organizing community-based inputs, providing settings where residents can become part of a cooperative enterprise, and pursuing similar ideals and common causes, such as neighborhood safety, historical preservation, economic development, and traffic calming. Other examples of using TOD as a centerpiece to community redevelopment can be found in neighborhoods like San Diego's Barrio Logan, Reistertown in Baltimore, the Commons adjacent to downtown Denver, Seattle's Rainier Valley, and Silver Spring, Maryland.

V.2 Successful Design Principles and Characteristics

Both real estate markets and research reveal that urban design is important, especially in compact settings like rail station areas. One can find plenty of examples, especially among mega-cities of the developing world, of dense mixed-use settings abuzz with pedestrian life that are loathsome places. What such settings universally lack are a human-scale environment to provide a sense of comfort, pleasantness, and attachment to place.

TODs and transit villages borrow heavily from European community design and town planning principles. In Europe, a transit station often represents more than a collection/drop-off point. Rather, it functions more as a centerpiece for community building and re-building—an organizing platform for creating a "compact, mixed-use community, centered around the transit station that, by design, invites residents, workers, and shoppers to drive their cars less and ride mass transit more" (Bernick and Cervero 1997, p. 5). Among the common features of many European transit villages are (1) stations as community hubs, both functionally and symbolically; (2) tapering of densities with distance from a station, like a wedding cake; (3) the presence of a major public amenity, like a civic square, that functions in part as a community gathering point (sometimes changing, chameleon-like, between farmers'

markets one day and open-air concert venues the next) as well as design elements that help to soften people's perceptions of density; (4) mixed land uses (e.g., shops, consumer services, restaurants, hotels, child-care centers) that provide all-day/all-week trip generators and promote travel efficiencies (e.g., trip-end consolidation and more balanced, bi-directional travel flows); (5) intermodalism, with care given to allowing efficient, sometimes seamless connectivity between transit and access/egress modes, including buses, cars, walking, and cycling; (6) an accent on livability, showcased by attractive landscaping, public amenities (e.g., street furniture, shade trees), and pleasant walking and milling environments[23]; and (7) parking management, often with market-rate pricing and the siting of parking facilities on peripheries. Today, some vestiges of TODs survive in America's "streetcar suburbs" of yesteryear, such as Shaker Heights in Cleveland, Chestnut Hill in Boston, Riverside near Chicago, Roland Park in Baltimore, and Country Club Plaza in Kansas City.

As with other aspects of TOD and TJD, urban design objectives too sometimes find themselves bogged by conflict. For example, the design principles found in the design guidelines of many transit agencies do not always square with the design principles being advanced for TOD. Many transit-supportive design manuals call for generous turning radii at street intersections that allow buses to easily negotiate turns (Beimborn and Rabinowitz 1991; Cervero 1993B; Ewing 1996). Such designs, however, are generally at odds with the minimalist street designs advanced by neo-traditionalists and TOD advocates (see: Calthorpe 1993; Beimborn and Rabinowitz 1991; Cervero 1993B) and contemporary traffic-calming principles that call for squaring-off and necking down intersections (see: Ewing 1996, 1999B).

[23] Urban designers like Jan Gehl (1992) of Copenhagen have long stressed the importance of attending to the needs and wants of non-walkers as well – those who would like to pause, sit, and mull for a while to enjoy a place or scenery, to read a book, or have a latte outdoors.

V.3 Station-Area Design and Scale

At the station level, TOD design considerations fall into three major categories:

- Densities needed to sustain transit investments;
- Land-use compositions and mixes that enrich the urban environment while also reducing car dependency; and
- Quality of public environments, particularly for pedestrians, along with design considerations related to parking and access management.

For each category, the appropriate design is informed by the local context. Depending on the quality of transit service, market characteristics, and regional location, the appropriate station-area design is apt to vary. Calthorpe (1993) has identified two prototypes of TODs:

- *Urban TODs*, which are located along major transit lines and feature "high commercial intensities, job clusters, and moderate to high residential densities" (p. 57); and
- *Neighborhood TODs*, which are located along feeder bus routes and typified by "a residential and local-serving shopping focus," with some mix of service, entertainment, civic, and recreation uses (p. 57).

Some TOD manuals further differentiate station types. The Denver Regional Transit

District (1996), for instance, provides guidelines for urban centers, regional centers, town centers, suburban centers, and transit corridors. TOD design guidelines are reviewed in this chapter for each major design consideration, based partly on review of TOD design manuals, some of which are examined and critiqued by Cervero (1993B) and Ewing (1997).

One of the first choices to be made in planning for a TOD or TJD project is to settle upon a territorial definition. What is the appropriate spatial extent of a TOD? Should there be a formal boundary or might it best be left loosely defined? While in some cases, particularly for TJD, the lead agency's plan may only address parcels that it controls or that are contiguous to the station area, TOD manuals suggest that it is preferable to undertake planning efforts at a larger scale. If the TOD is part of a legally defined redevelopment district, then its boundaries will be firm; otherwise, it need not be finely demarcated. Among transit-agency TOD manuals reviewed, there was a consensus that the planning area for a TOD should extend to between a quarter-mile and a half-mile from a transit station, roughly the distance associated with a leisurely 5- to 15-minute walk (Denver Regional Transit District 1996; Twin Cities Metropolitan Council 2000; Puget Sound Regional Council 1999; New Jersey Transit 1994). Some jurisdictions have been more specific, defining walking distance boundaries within TOD ordinances and design guidelines (Table 7).

In addition to using comfortable walking distance, Calthorpe (1993) opts to define TODs in terms of land coverage. He contends that a TOD plan should encompass at least 10 acres for redevelopment sites and 40 acres for new growth areas—producing sufficient numbers of residents, workers, and shoppers to make investments in rail transit more feasible. Redevelopment projects like San Diego's Barrio Logan, at 10.9 acres and Hillsboro's newly built Orenco station project, at 200 acres, meet such thresholds.

Calthorpe's acreage thresholds reflect, in part, the distance that people are willing to walk in order to access transit, as shown in Figure 6. As noted earlier, studies indicate that acceptable walking distances can be stretched considerably by creating pleasant, interesting urban spaces and corridors (Untermann 1984). They are also influenced by factors such as topography, climate, presence of freeways or major arterials, and mix of land uses. People are typically

Table 7. District Boundary Definitions in TOD Ordinances

Jurisdiction	Distance of District Boundary
Seattle, WA	¼-mile radius from LRT station
Hillsboro, OR	1,300-ft radius from LRT station
Portland, OR	¼-mile radius from LRT station
Washington County, OR	½-mile radius from LRT station; ¼ mile radius from primary bus routes
San Diego, CA	2,000-ft radius from transit stop

Source: Community Design + Architecture (2001).

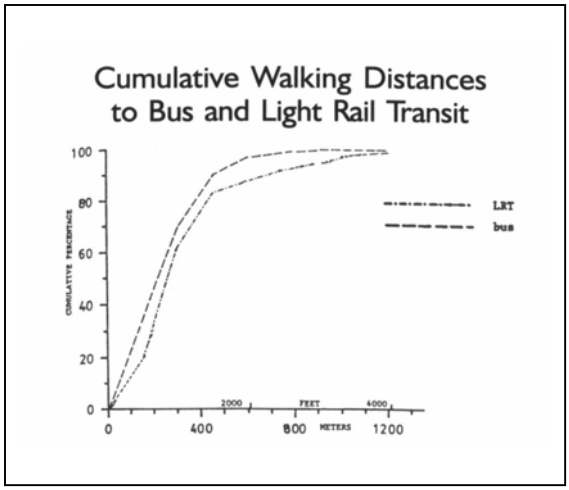


Figure 6. Walking Distance Benchmarks
Source: Ewing (1997)

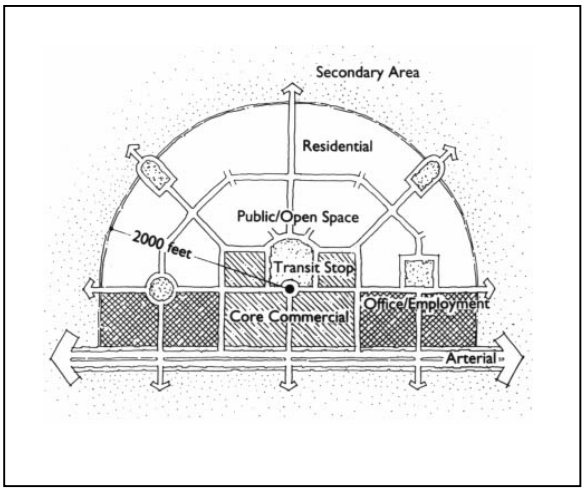


Figure 7. Walking-Scale TOD
Source: Calthorpe (1993)

willing to walk farther to transit stations that offer high levels of service, such as a rail facility. They will also walk farther between a station and a place of employment or a residence than they will to a retail establishment (Puget Sound Regional Council 1999). Safety and comfort are also important factors. The presence or absence of barriers and amenities will greatly affect the walking experience. Figure 7 shows a TOD that is defined by a distance of 2,000 feet from a transit station, typically a distance that can be covered within 6 to 8 minutes by foot. In this example, the size of the TOD is also constrained by the presence of an arterial.

According to Ewing (1999A), TOD design manuals disagree about the spatial contexts for node-based versus corridor-based TOD planning. Two of the design manuals appear to have resolved this debate by advocating both types of planning (Twin Cities Metropolitan Council 2000; Denver Regional Transit District 1996). Notably, the manuals indicate the following:

- Node-based planning for rail and bus rapid transit stops are generally spaced too far apart to allow uniformly dense corridors; and

- Corridor-based planning along local bus routes with frequent stops are recommended.

V.4 Built Environments and TOD

Arguably the most important design element in creating a successful TOD is the density and mix of land uses. Without high enough densities, transit stations will fail to attract many passengers (Pushkarev and Zupan 1977). Moreover, without an appropriate mix of complementary land uses, people will be less inclined to patronize transit, as their ability to access a variety of destinations will be limited. Importantly, balanced and mixed land uses along rail-served corridors can produce travel efficiencies, with balanced, bi-directional flows (Cervero 1998A). Urban design also matters, in part because quality

urban spaces soften people's perceptions of density—living, working, and shopping in busy compact settings can be enjoyable as long as they are complemented by attractive landscaping, civic squares, tree-lined pathways, and other amenities. Attention to the "3 Ds" of built environments—density, diversity, and design—is as important around transit stations as anywhere else (Cervero and Kockelman 1997).

Density

Implicit in the creation of TOD is increases in densities above those typically found in American cities and suburbs. "Mass transit needs mass" (Bernick and Cervero 1997, p. 74). Densities (1) shorten trips by bringing activities closer together; (2) induce more non-motorized (walk and bike) travel; and (3) increase vehicle occupancy levels for motorized trips by encouraging transit usage and ride-sharing. Collectively, these three factors influence vehicle miles traveled (VMT), what is widely considered to be the most all-encompassing indicator of travel consumption and the best single measure for tracking sustainability trends (Ewing 1995).

Research consistently shows that density has a significant bearing on transit ridership. In a 1995 Transit Cooperative Research Program (TCRP) study of boardings at 261 light rail stations across 19 U.S. and Canadian cities, an elasticity of nearly 0.60 was found between ridership and population density—controlling for other factors, every 10-percent increase in population density was associated with about a 6-percent increase in boardings at LRT stations (Parsons, Brinckerhoff, Quade and Douglas et al. 1995). Citing experiences from 11 studies, Ewing (1999A, p. 2) notes that "the weight of available evidence points to the importance of density in promoting walking and transit use." He suggests several rules of thumb for residential densities in TODs:

- To support basic bus service, seven units per gross acre are required (Ewing 1999A).
- To support premium bus service, the density rises to 15 units per gross acre (Ewing 1999A).
- Still higher densities are required to support rail service, with most TODs in the United States in the range of 20 to 30 units per acre (Ewing 1997).

Guidelines for the average gross density within a station area are quite important, as they indicate the levels of activity that are needed to support various types of transit service. Such guidelines also provide flexibility, such that densities may be distributed, according to the local context. Three U.S. jurisdictions that have proposed or adopted TOD standards—San Diego, Washington County (Oregon), and Portland (Oregon)—call for higher minimum thresholds depending on TOD type and levels of transit services (Table 8).

Figure 8 shows several TOD plans that achieve a gross residential density of 18 units per acre. These plans typify most TOD designs in that they concentrate the highest density uses near station portals. JFK & Associates (1987) and Cervero (1993B) have shown that such "wedding cake" density gradients maximize transit ridership.

TOD manuals are quick to point out that residential density is only one of many factors affecting transit ridership and that appropriate densities vary according to local conditions. Higher employment densities, for example, may compensate for lower household densities. The Puget Sound Regional Council (1999) contends that employment densities of 25 jobs per gross acre will support frequent,

City/ Source	TOD Type	Minimum Residential Densities (Dwelling Units/acre)
San Diego TOD Guidelines	*Urban TOD* (LRT served)	25 (18)
	Neighborhood TOD (Bus served)	18 (12)
Washington County, Oregon (LUTRAQ Study)	Urban TOD (LRT served)	15 (7)
	Neighborhood TOD (Bus served)	8 (7)
Portland Tri-Met, TOD Guidelines	*LRT Served TOD*	30: 0-1/8 mi 24: 1/8-1/4 mi 12: 1/4-1/2 mi
	Bus Served TOD	24: 0-1/8 mi 12: 1/8-1/4 mi

Table 8. Residential Density Thresholds for TODs
Source: Community Design + Architecture (2001)

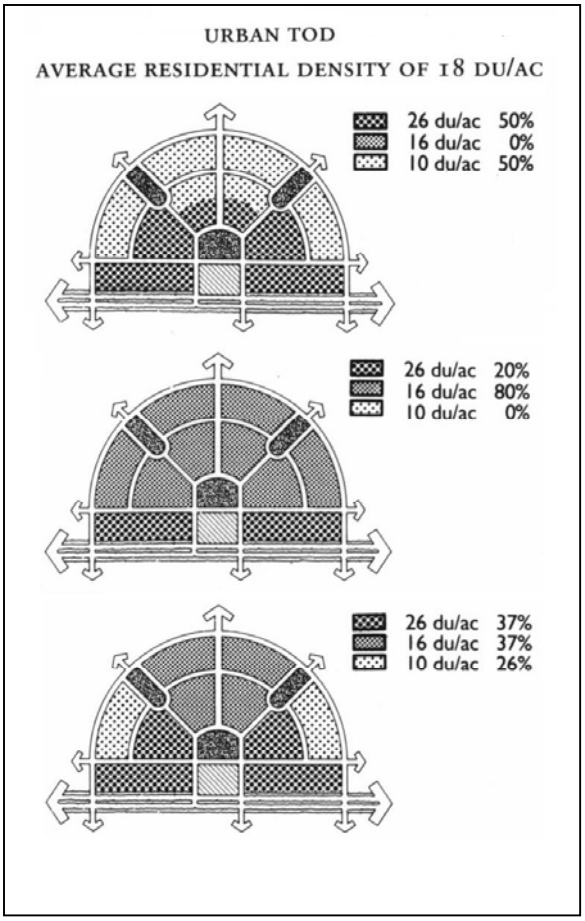


Figure 8. Density Gradations for an Urban TOD. *Source*: Calthorpe (1993)

high-capacity transit service. This density translates into 15,000 jobs within a half-mile radius of a station. For light rail service, employment densities of 50 jobs per gross acre are favored (Puget Sound Regional Council 1999; Ewing 1999A). The TCRP H-1 (*Transit and Urban Form*) study estimated that downtown densities of 100 workers per gross acre translate, on average, into 300 boardings per day for suburban light rail stations 20 miles from a downtown that are surrounded by low-density residences (of five persons per acre) (Parsons, Brinckerhoff, Quade and Douglas et al. 1995).

Where a station provides parking, it will not require as much density to generate desired ridership levels. An oversupply of park-and-ride lots at transit stations, however, can undermine regional land-use benefits (Cervero and Landis 1997). In many typical suburban settings, park-and-ride lots are essential to rail ridership success, especially at terminal stations that draw customers from a large, sometimes exurban/semi-rural, catchment. The Puget Sound Regional Council (1999) recommends park-and-ride lots only in areas where immediate development is not expected. Ewing (1997) indicates that park-and-ride lots are only appropriate when there is a long commute to downtown ("by one estimate 15 to 50 miles" by express bus) (p. 47). The city of Seattle has opted to limit park-and-ride lots planned for the LINK light rail networks to terminal stations to maximize

development potential and encourage TODs. Parking lots need not preclude TODs, at least in the long term. Indeed, they can serve as an interim use, banking land for eventual infill conversion if and when market conditions are ripe. The new federal rulings on joint development permit-parking lot conversions as a " back-door form" of land-banking.

Land-Use Mixes

In addition to being compact, it is widely agreed that TODs should be diverse in their land-use compositions. Mixed land uses offer a number of potential transportation benefits, whether in TODs or any other urban setting. One, they can internalize trips within neighborhoods, prompting residents to walk to convenience shops instead of driving outside the neighborhood. At suburban workplaces, the presence of on-site eateries, retail shops, and consumer services free workers from the need to solo-commute since they need not feel stranded during the midday without a car (Cervero 1996B). Such uses also reduce off-site midday travel. Research from Southern California estimates that mixed-use suburban work settings increased transit usage by, on average, 3.5 percent relative to otherwise comparable single-use workplaces (Cambridge Systematics 1994). In addition to these demand-side benefits, mixed-use environs confer supply-side benefits: shared parking possibilities that reduce overall parking supplies and expenses (thus making TODs with shared-parking more profitable); reduced infrastructure loads and facility sizing (since road access, water consumption, etc. peaks at different times-of-day and days-of-week for retail versus employment uses); and bi-directional use of infrastructure (since activity centers become both trip origins and destinations) (Cervero 1996B; Bernick and Cervero 1997).

The presence of a retail center and workplaces at the core is a prominent feature of most TOD plans. TOD design guideline manuals consistently call for commercial uses in the TOD core that consist of ground-floor retail, offices, restaurants, and consumer services, like bakeries and convenience shops. Many also call for day-care centers near the core that allow parents to consolidate trips by dropping their kids off and then catching a train to work, all in the same vicinity.

In determining the appropriate size and mix of a core commercial area, most TOD design guidelines are careful to note that the type of commercial and retail uses should be informed by neighborhood objectives, market realities, and existing development patterns (Cervero 1993B; Calthorpe 1993; Ewing 1999B). The Puget Sound Regional Council (1999) contends that decisions regarding the amount of retail-commercial development should weigh local market conditions and provide an opportunity to conduct some non-work errands. At a minimum, this means placing convenience shops and newspaper kiosks right at stations, if not inside (also thereby producing concession income). Calthorpe (1993) sets a minimum standard, holding that the core commercial area should occupy a minimum of 10 percent of the total site, with at least 10,000 square feet of retail space adjacent to the transit stop. For large urban TODs, he calls for the creation of four types of commercial centers:

- "Convenience shopping and services (10,000 to 25,000 sq-ft);
- "Neighborhood centers with a supermarket, drug store and supporting uses (80,000 to 14,000 sq-ft);
- "Specialty retail centers (60,000 to 140,000 sq-ft); and

- "Community centers with convenience shopping and department stores (120,000 sq-ft or greater)" (p. 77).

Figure 9 portrays Calthorpe's guidelines for the desired balance of land uses within station areas and depicts land-use plans that achieve desired densities. The Puget Sound Regional Council (1999) suggests that to ensure a good balance of activity within a TOD, the number of jobs should not exceed the number of residents by more than 3 to 1. New Jersey Transit (1994) encourages mixing uses within station areas to generate peak and off-peak ridership (e.g., mixing office with entertainment uses to encourage activity beyond normal business hours). Scandinavian experiences suggest balance is less important within a particular TOD than among TODs that have been strategically located along rail-served corridors (Cervero 1998A).

Use	Neighborhood TOD	Urban TOD
Public	10–15%	5–15%
Core/Employment	10–40%	30–70%
Housing	50–80%	20–60%

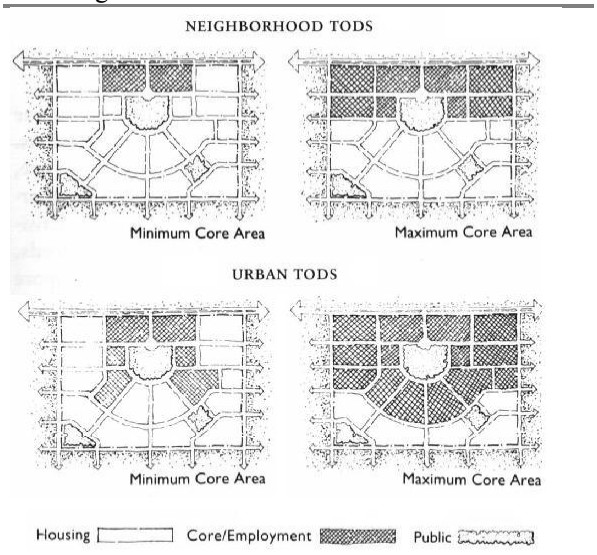


Figure 9. Land-Use Prototypes for TODs.
Source: Adapted from Calthorpe (1993)

In metropolitan Stockholm, where the jobs-housing balance has been achieved along linear rail corridors, with TODs interconnected like "pearls on a necklace," trains tend to be full in both directions, resulting in efficient use of rail capital. This is despite some of Stockholm's suburban TODs being veritable bedroom communities. As long as balanced land-use patterns are maintained at a corridor, balanced travel flows can be expected.

Design guidelines tend to be fairly general in defining land-use mixes, rarely listing types of businesses that should be included in a TOD. Activities that allow people to link trips together, like day-care facilities and dry cleaners, however, are frequently mentioned as desirable. The city of San Diego grants density bonuses for developments that include child-care centers near Trolley stations. Lynwood, Washington, has created a special mixed-use/transit-supportive zone that grants special use permits to any of the following activities that are sited near transit stops: banks, professional businesses, retail stores, offices, and child-care facilities (Bernick and Cervero 1997). Figure 10 shows various consumer-oriented land uses that the Snohomish County Transportation Authority (1989) has classified as being compatible with transit. Design manuals consistently state that auto-centric uses, such as drive-though and auto dealerships, are inappropriate for a TOD.

Design Quality

A final element in the triad of supportive physical characteristics of TODs is design quality. Quality of walking environment is particularly important. "Since all transit trips involve some degree of walking, it follows that transit-friendly environments must also be pedestrian-friendly" (Bernick and Cervero 1997, p. 91).

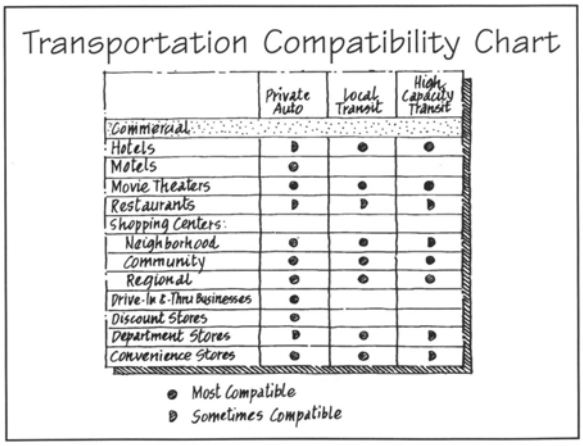


Figure 10. Land Uses Compatible with Transit. *Source*: Ewing (1997)

Well-designed places are also crucial for quality-of-life reasons. Calthorpe asserts that by building TODs around accessible and convenient public facilities and spaces, a neighborhood can promote safety and comfort through a "strong sense of community, participation, identity, and conviviality" (1993, pg. 59). And as noted, it is increasingly recognized that good-quality urban spaces are critical to successful TODs if for no other reason than they make the necessary densities to support costly rail transit services acceptable in the minds of many residents.

Many TOD efforts face the challenge of how to retrofit and convert existing auto-oriented urban spaces (Figure 11). For the most part, upfront public improvements are called for—like landscaping, street furniture, sidewalks, and bus shelters—that signal to developers a public commitment to turn around a declining area. The idea is to seed private investments through public funding commitments. Design principles that are rooted in market realities, recognizing that design upgrades cost money, sometimes a good deal of it, are also becoming more commonplace.

The following principles have been advanced for achieving pedestrian-friendly designs in TOD settings:

- Create pedestrian streets that will primarily serve foot traffic and encourage bicycle travel (Puget Sound Regional Council 1999).

- Orient buildings to the street with set backs of no more than 25 feet (Ewing 1999A). Buildings placed close to a street minimize walking distances between destinations and also provides visual enclosure, an important element in creating a comfortable outdoor environment. Though there is some disagreement between urban designers, Ewing (1997) suggests a ratio of building height to right-of-way and set-back width of 1:3. This translates to 20-foot high store fronts on 60-foot wide lots.

- Set minimum floor-area ratios (FARs) for retail and commercial uses to create a lively streetscape and minimize dead spaces created by parking lots.[24] Calthorpe (1993) suggests a minimum FAR of 0.35, while the Puget Sound Regional Council (1999) suggests a target of 0.5 to 1.0 for developments without structured parking and at least 2.0 for developments with structured parking.

- Use gridlike street patterns that allow many origins and destinations to be connected by foot; avoid cul-de-sacs, serpentine streets, and other curvilinear alignments that create circuitous walks and force buses to meander or retrace their paths (Bernick and Cervero 1997).

[24] A FAR equals the square footage of the building floorspace divided by the square footage of the parcel that the building sits on.

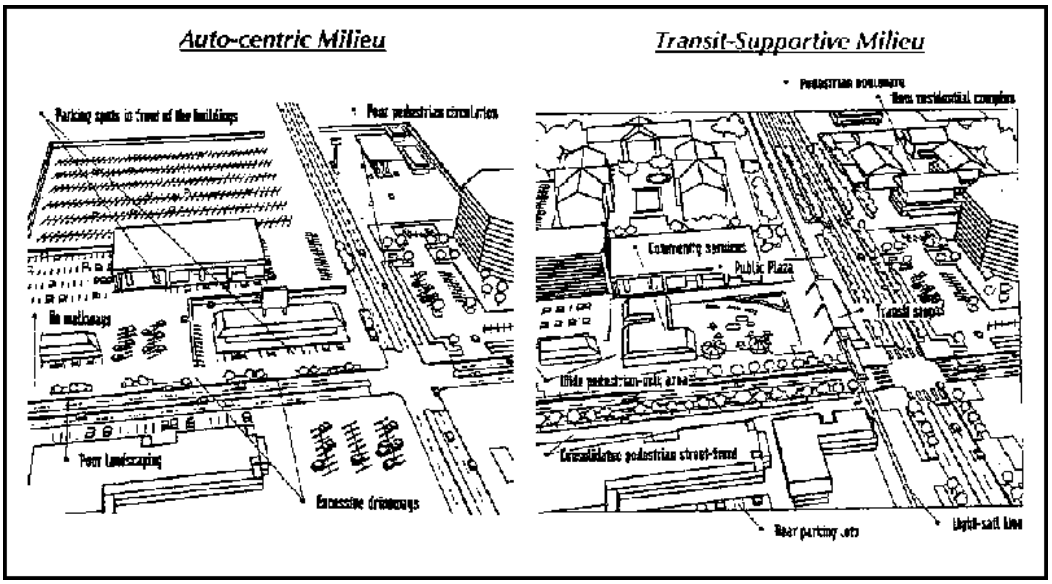


Figure 11. Visual representation of design approaches toward converting an auto-oriented commercial district to a transit-oriented neighborhood.
Source: Bernick and Cervero (1997).

- Use traffic-calming measures such as narrow streets, on-street parking, vertical realignments (e.g., street tables), horizontal realignments (e.g., chicanes), and street trees (Ewing 1999A; Puget Sound Regional Council 1999). Ewing (1999A) contends that street trees spaced 30 feet apart provide an added benefit of creating visual enclosure.

- Shorten trips through good site planning, using short blocks and straight streets, minimal building setbacks, and pedestrian shortcuts. To encourage walking, block lengths of 300 feet are suggested since smaller block faces allow for high levels of pedestrian connectivity (Ewing 1997).

- Provide a continuous network of sidewalks wide enough to accommodate anticipated levels of pedestrian traffic (Ewing 1997). Sidewalks should be located along or visible from all streets and allow comfortable, direct access to core commercial areas and transit stops (Puget Sound Regional Council 1999).

- Ensure safe, convenient, and frequent street crossings. Signalized crossings, bulb-outs, and mid-block crossings are recommended (Puget Sound Regional Council 1997). Ewing (1999A) notes that smaller corner radii shorten crossing distances, induce motorists to slow down at corners, and discourage rolling stops. Bus drivers, however, counter that tight turning geometries hamper bus movements.

- Use landscaping, weather protection, public art, street furniture, lighting, public phones, and other provisions in public spaces. Likewise, require all developments to provide for pedestrian and cyclist needs, such as benches, continuous awnings, bicycle racks, and street trees (Puget Sound Regional Council 1999).

TOD designers point out that such design elements cannot stand in isolation—indeed, they are co-dependent. Grid-iron streets of a superblock scale without continuous sidewalk networks, for example, are unlikely to entice many suburbanites to give up their cars. Collectively, transit-sensitive design elements can create fundamentally different milieus in and around transit stations that make transit riding a pleasant experience.

V.5 The Evolutionary Approach to TOD

In a critique of TOD design practices, Ohland (2001B, p. 4) quotes Jeff Rader of the Atlanta Homebuilders Association:

> Jane Jacobs' critique of urban renewal in the '60s applies to TOD in the '90s. The practice of constructing a rail station and assembling and clearing the land around it in the hopes of eventually building a mega-TOD project does not work any better than clearing away blighted communities in order to erect high-rise public housing or master-planned communities—an approach that has long since been discredited. Development needs to happen more organically, with a gradual layering of infill over generations, because the 'clean slate' approach means that a single project must bear the full cost of redevelopment.

While some communities choose to implement TOD projects wholesale by ripping out preexisting, suburban uses in parcel-sized chunks and replacing them with TOD structures, others have taken a more evolutionary approach. In particular, mixed-use projects with significant retail components have been found to be a significant challenge since the design requirements of national retailers and their requirements for parking are a major impediment to the design goals of TOD plans. Near Denver, the Englewood City Center is a mix of retail and office space, 450 units of residential housing, gridded streets, a City Hall, library, museum, park and open space all adjacent to the Southwest rail station. While this description seems to evoke many of the ideals of TOD design, according to Ohland (2001B) this development "stretches the definition of TOD." The retail portion of the project is anchored by a Wal-Mart big-box outlet that is surrounded by a large parking lot. The ratio of 4.9 parking spaces per 1,000 square feet of retail floorspace, while below the optimal level for automobile-oriented retail, is still high for a transit-oriented site. The other stores and restaurants in the complex are stand-alone, each similarly surrounded by parking, with ratios of 6 per 1,000 square feet. A nine-foot-high soundwall separates the retail uses from the busy bus transfer center and further serves to cut off the retail space from pedestrian and transit access.

The saving grace of such built environments is that they are malleable. While the Edgewood City Center was slated early on to serve the automobile patrons, its site design has been arranged to facilitate a gradual shift toward a more transit-oriented future. While the Wal-Mart is at the far end of the site away from transit, the pedestrian system is laid out to allow an easy walk past a mix of uses. An elegant pedestrian bridge takes riders directly from the train to the development and the residential units are very convenient to transit. These elements help lay the foundation for a more pedestrian-friendly future. To allow for further improvements, the site's buildings were built to front on the adjacent streets and the parking was placed in the block's interior. In this way, the focus of pedestrian access can be moved toward the street at a later phase, and the interior parking areas can be developed with additional retail or other uses, densifying the site. Furthermore, parking spaces can be consolidated into a parking structure to minimize its presence. In the meantime, the project will meet the needs of the surrounding community's working and

middle-class residents who see a more pressing need for a general merchandiser and the benefits to local tax coffers that a Wal-Mart can provide (Ohland 2001B).

Center Commons, Portland, Oregon

This project, near the 60th and Glisan station on MAX's eastbound line, is regarded by Tri-Met, Portland Development Commission, and the neighborhood as a model for TOD and infill development in the city's station-area districts. The project features 314 housing units at both market and affordable rates, retail space, and a day-care center. The focus on urban design and livability is unmistakable. A Dutch-like "woonerf" space brings together cars, pedestrians, a playground, a bosque of trees, parking, drop-off zones, and a generous network of sidewalks with shortcuts to transit.

Source: Otak (2001)

VI. CONCLUSION

This literature review of TOD and TJD shows that a fair amount is known about inputs (e.g., policy initiatives and implementation tools), less about outputs (e.g., formation of TODs), and even less about outcomes (e.g., effects on ridership, traffic conditions, and air quality). The complexity of relationships and data constraints suggest that case-study approaches will continue to be relied upon to advance our knowledge and understanding of TOD and TJD. The second-phase of the TCRP H-27 project is committed to conducting case-studies that will fill, to some degree, existing knowledge gaps regarding the practice of TOD and TJD.

The literature on TOD is fairly extensive and continues to expand on the heels of the "TOD renaissance" sweeping parts of the Unites States. Fueled by rising traffic congestion, housing shortages, and smart-growth agendas, TODs are picking up steam in most U.S. rail cities. TOD is generally accepted as a desirable land-use outcome, though this is more an article of faith than a product of empirically backed research. The topic of TOD and its potential societal benefits is often treated in general, abstract terms. The focus tends to be on outputs—i.e., what is being done to bring about compact, mixed-use development near rail stations—versus on outcomes—i.e., evidence of congestion relief, affordable housing production, or economic rejuvenation of inner-city neighborhoods. What constitutes a TOD still tends to be loosely defined; thus, drawing judgments and informing public policy about successes and failures can be problematic.

Among the more significant knowledge gaps that remain about TOD are the following:

- *Public Benefits*. As noted, public benefits attached to TOD, such as congestion relief and air-quality improvements, accrue only to the degree that increased transit patronage is matched by reduced automobile usage. That is, only by encouraging Americans to drive less and ride trains and buses more will TODs contribute to smoother traffic flows, cleaner air, and energy conservation. While literature shows that those living and working in TODs ride transit more than others, there is scant evidence that these trips substitute for and reduce the level of private automobile travel. For example, many residents of TODs also took transit to work at their previous residence, suggesting that many are already predisposed to bus and rail commuting. The research literature has only scratched the surface in determining how much the ridership benefits of TOD are a product of residential-sorting and self-selection, and what this implies in terms of zoning to accommodate the residential location choices of those inclined to live near transit stops.

- *Private Benefits*. Land markets express the benefits of TOD, and in this regard the literature is fairly divided. For every study that shows that being near transit raises property values, there is at least one study that shows it does not. Capitalization benefits appear to vary by types of land uses (with commercial and multi-family housing generally reaping the highest value-added), but our knowledge on the degree to which different transit modes confer different land-value benefits (as a product of differences in accessibility impacts) under different circumstances (e.g., permissive versus restrictive zoning) remains partial. In addition, most capitalization studies have focused on the value of proximity to transit, but hardly any have sought to assign benefits to TODs per se. Nor is much known about the value of different mixed-use

configurations within TODs.

- *Finance and Implementation*. Much of the literature on finance and implementation is descriptive versus evaluative and analytical. Case experiences generally outline the source of creative financing partnerships, but how they influence TOD implementation (versus, for example, control sites without the benefits of creative financing) is not well documented. Given the risk-sharing associated with TODs, it would be helpful to know more about how financial burdens were ultimately distributed among vested interests and stakeholder groups. The literature is also fairly silent on the degree to which TOD success stories might be transferable. The influences of external factors, like macro-economic conditions and sub-regional real estate market conditions, on TOD implementation are not particularly well known.

- *Organizational and Institutional Factors*. It is well understood that partnerships that pool resources, share risks, and nurture close working relationships are absolutely essential to the implementation of successful TODs. Moving beyond the rhetoric, however, one finds little in-depth research into the ingredients of successful TOD partnerships: Who typically initiates the process? Are most transit boards leaders, followers, or maybe even disinterested parties? How important are master plans in orchestrating the evolution of TODs? Are certain institutional models more successful than others? What about the involvement of higher levels of government? So far, the relative importance of vertical (federal-state-local) versus horizontal (transit agency-municipality-MPO) linkages in bringing about TODs has yet to be examined.

By comparison, the literature on TJD tends to be more coherent and our understanding of factors that bring about successful projects tends to be better formed. This is partly because TJD is usually easier to define—it is project-specific, often based on some form of binding and legally enforceable agreement. A permissive legislative environment, combined with a successful track record at TJD in metropolitan Washington, is prompting more and more large transit agencies to become entrepreneurial. There is an increasing recognition that transit not only serves but can help create markets.

Research into the institutions, politics, methods, and impacts of TOD and TJD is needed now more than ever. Policy-makers and taxpayers need and want to know when, where, and under what conditions TOD and TJD initiatives make sense. There is a huge pent-up demand for best-case practices that others can imitate and learn from.

While research has its place, ultimately whether TODs and TJDs are desirable will be determined through the marketplace. Rising rents and waiting lists to occupy office space and apartments near rail stops in some areas hint at a growing consumer realization of the benefits of living, working, and doing business in TODs. However, markets do not always operate unobstructed. NIMBY opposition, foot-dragging among public agencies, and skittishness in lending communities, among other factors, can suppress the best of TOD intentions. A hornet's nest of institutional, regulatory, and political factors complicate the practice of TOD and TJD in the United States today. Case experiences, directed research, and the dissemination of best practices offer the best hope of illuminating the forces that both spur and impede transit-supportive growth and rationalizing public policies so as to improve the day-to-day practice of TOD and TJD.

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APPENDIX A: ANNOTATED BIBLIOGRAPHY

Annotated summaries of some of the more important literature on TOD and TJD in the United States are presented in this appendix. While there are other significant writings on these topics cited in the literature review that are not presented here, this annotated bibliography is thought to be representative of much of the scholarly and analytical literature on the subject. In particular, the materials presented in this appendix are products of research on TOD and TJD; thus, they are more analytical and evaluative than descriptive in scope. The annotated summaries are organized according to the four sections of the literature review: Institutional Issues; Evaluation of Impacts and Benefits; Implementation; and Urban Design.

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Section II. Institutional Issues

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Transit Villages and Transit-Based Development: The Rules are Becoming More Flexible–How Government Can Work with the Private Sector to Make It Happen
Michael S. Bernick, & Amy E. Freilich, *The Urban Lawyer*, Vol. 30, No. 1, 1998, pp. 1-31.

While transit-based development has been viable in areas where the economy is active and developers come forward on their own initiative with project proposals, many transit systems and the properties they own are in areas where the economy is stagnant or in decay. Transit-based development in these areas requires public-sector contributions and involvement. This article presents an overview and analysis of recent legal developments that have an effect on transit-based development and gives an overview of the implementation tools available to public and private actors engaged in efforts to create these developments.

At the federal level, this article focuses on recent legislative and legal initiatives. The Federal Common Grant Rule has recently been revised to permit transit agencies that purchased property with transit grant funds to keep the sale proceeds as long as the they keep sufficient control of the property to ensure its physical and functional linkages to the transit system. This revision also allows transit agencies to make sales to developers based not on the highest revenue returns from the sale, but on the agency's assessment of which development proposal will develop the site in its "highest and best *transit* use."

Other legal and legislative changes covered in this article are: (1) Section 3(a)(1)(D) of the Federal Transit Act, which allows the secretary of transportation to make loans and grants for projects that enhance transit's effectiveness; (2) the 1991 Intermodal Surface Transportation Efficiency Act (ISTEA) which allows the secretary of transportation to make loans and grants for non-vehicular capital improvements that would enhance transit usage; (3) the (now discontinued) Livable Communities Initiative, which provides funds for community facilities near transit lines intended to increase ridership; (4) and the New Starts Criteria for transit system construction and expansions that gives preference to projects in areas that have transit-supportive land-use policies.

The article points out that the main players in transit-based development are not at the federal level, but are rather the state and local agencies responsible for implementation. Since state governments statutorily create most transit agencies, these statutes must explicitly give transit agencies the means to engage in joint development projects. Statewide concurrency legislation, which requires new developments to provide adequate infrastructure to support the new uses being built, can also be used to guide development into transit corridors where such requirements can be waived. The California Transit Village Planning Act allows local governments to make Transit Village Development Plans, similar to general plans, which can include density bonuses, increased access to transportation funding sources from the state, assistance in establishing expedited permitting processes, and exemption from the minimum level of service requirements for developments in proximity to regional routes of significance.

The article provides a number of recommended tools and implementation measures that can be used by local governments and transit agencies. They are: (1) the use of transit district-owned land for development; (2) the assembly of land; (3) infrastructure investment (directly or through tax increment financing); (4) parking development and utilization of shared-use parking; (5) underwriting of land costs; (6) direct financial participation (issuance of tax exempt bonds, low-interest loans, loan guarantees, grants, equity participation); (7) expediting the entitlement approval

process; (8) the provision of station-area benefits in exchange for land or other private-sector contributions; (9) the location of public facilities within transit-based developments to spur economic activity; and (10) utilizing flexible development approaches (design-build/turnkey) and creation of public/private subsidiaries.

Case studies are given of the Richmond Transit Village (BART) and Westlake/MacArthur Park (LAMTA) projects.

Public Finance and Transit-Oriented Planning: New Evidence from Southern California
M. Boarnet and R. Crane, *Journal of Planning Education and Research,* Vol. 17, 1998, pp. 206-219.

Based on experiences with commuter rail in Southern California (MetroLink) and light rail transit in San Diego (MTDB), the authors test the hypothesis that municipalities refrain from zoning for housing since it is in their fiscal interest to attract higher tax-yielding residential uses to station areas. This is thought to be particularly the case in California, where Proposition 13 has prompted many local governments to seek out and actively compete for commercial and retail land uses and the sales tax revenues they generate.

The authors gathered zoning data for quarter-mile rings around each of 232 existing or proposed rail stations. While more land was devoted to residential uses than any other category, considerable variation was found and the sum of commercial plus industrial uses in most instances exceeded the residential total. Using a location quotient methodology, the authors found 47 percent higher shares of high-density residential and 340 percent higher shares of commercial zoning near stations than citywide averages.

Using multiple regression techniques and statistically controlling for factors like median household income, the research showed that station areas with relatively high shares of city commercial uses near them tended to be in cities that were relatively highly dependent on sales taxes and property taxes for revenue. While fiscal zoning for economic development reasons seemed to be alive and well around Southern California rail stations, the authors cautioned that other factors might have explained zoning biases as well, including neighborhood resistance against high-density housing.

Transit Villages in California: Progress, Prospects, and Policy Reforms. R. Cervero, Institute of Urban and Regional Development. Working Paper 98-08, 1998.

In 1994, the state of California enacted legislation, which at least nominally promised to bolster transit-oriented development. As originally envisaged, the California Transit Village Development Planning Act would have extended land development powers to transit village districts and mandated increased densities around transit stations. By the time it was ultimately signed into law, however, the increased land development authority had been removed and the mandatory density bonuses had become discretionary choices for local jurisdictions. In 1998, when the Transit Villages report was written, the law was still little understood by planning practitioners and had never been applied. The author concluded that the act is essentially restatement of already existing laws, except that it exempts transit village district impacts from level-of-service requirements that are part of California's congestion management laws.

After reviewing the history of TOD-related legislation in California, the author examines each of the transit systems in the state to give an overview of policies and actions taken by public agencies to encourage TOD. He concludes that most projects have occurred in redevelopment districts and little has occurred on infill or greenfield sites. The author further concludes that some level of public involvement has been necessary in all instances. This involvement has come primarily from redevelopment agencies, transit agencies, and local governments, in declining order of importance. The author argues that when it comes to land use, these agencies are essentially creatures of the state as their special authorities rely on enabling legislation.

Based on this conclusion about the importance of state enabling legislation and supported by arguments about the opportunities to supply affordable housing and maximize returns on state investments in rail, the report concludes with a number of policy recommendations for state legislators. Based on inputs from various TOD stakeholders throughout the state, the author favors

- Extending redevelopment powers to the transit village district, regardless of whether they are economically or physically blighted;
- Earmarking state transit village funds specifically rather than having them compete as capital projects; and
- Simplifying development processes by clarifying the relationship of transit village plans to general plans and making transit village plans equivalent to specific plans, which must undergo an environmental review that may in turn obviate the need for further environmental reviews on a project-by-project basis.

Private Land with Public Partnerships for Transit Based Development S. Lefaver et al., The Mineta Transportation Institute, Report 97-1, 1997.

Caltrans and the U.S. Department of Transportation comissioned this study of transportation-oriented development. Its definition of TOD centers on transportation rather than transit and includes high-density residential or mixed-use development along freeways as well as bus and rail lines. To conduct this study, the authors performed a literature review, which, in turn, informed their selection of 10 sites for detailed study. These case studies along with the author's observations and analyses are presented.

The 10 case studies in the document are drawn from the following metropolitan regions: Atlanta, Portland, San Diego, the San Francisco Bay Area, and Washington D.C. The case studies provide descriptions of the projects and their surrounding communities followed by detailed explanations of the roles played by various public entities and the private developer. The authors include descriptions of the negotiation process and the development agreements. Each study concludes with an explanation of the results and an analysis of the project. The analysis focuses on the difficulties in project implementation and evaluates the projects' success from public and private perspectives.

The latter sections of the study provide the author's insights into the TOD process as derived from the author's case studies. The author identifies the following important concerns in the structuring of partnership agreements:

- Determination of lease length. Most developments studied utilized long-term ground leases ranging between 30 to 55 years;
- Structuring of lease payments. The author states that projects may be more successful where public agencies forego up front or early payments in exchange for a share of proceeds, e.g., Ballston Metro Center;
- Subordination. According to the author, subordination, the practice of a public agency agreeing to subordinate its interest to that of other lenders, can at times be necessary to obtain TOD project financing;
- Land Assembly. The author recommends that, where possible, a redevelopment agency rather than a transit agency should take the lead in assembling land. They note, however, that redevelopment agencies are only able to assemble land in redevelopment zones and that most transit agencies do have the power of eminent domain.
- Structured Shared Parking. The author cites the potential to share structured parking, which exists at suburban transit stations, as a means of off-setting parking costs, particularly for developments with night and weekend parking needs.

The author also identifies the following barriers to effective public/private partnerships: reluctance among developers to build products without market research for comparable products; land-use requirements that place unfeasible restraints on development; RFP processes that require large commitments of time and money; expectations that transit and commercial/residential projects be completed simultaneously; and performance-based specifications, such as housing-affordability requirements, that are not supported by public financing, grants, or subsidies.

TCRP Synthesis of Transit Practice 20: Transit-Focused Development, D. Porter, Transportation Research Board of the National Academies, 1997.

This report looks back at the North American experience with transit-focused development and contains a literature review of existing research on the connection between land use and transportation. Its primary focus, however, is on the government role in shaping development within one-half mile of station areas. In the research for this report, the author conducted a survey of 19 North American transit agencies.

According to the author, enthusiastic government support is necessary to promote transit-focused development for a number of reasons, including the location disadvantage of some stations, the problem of land speculation, and existing government policies or inter-jurisdictional conflicts that may hinder optimal forms of development. The efforts of regional and local governments and transit agencies are explained in the report and categorized according to their strength and effectiveness. In 11 of the 19 regions surveyed, the author found that public agencies provided relatively strong government support. These regions were typified by regional planning agencies and transit agencies that had adopted significant policies and regulations to encourage station-area development. Several of these regions also had regional transit authorities that actively promoted joint development. Four of the regions had taken significant but less enthusiastic stances to encourage transit-focused development. These regions were typified by a general interest in station-area development, but few specific policies to encourage it. In the four remaining regions governmental support was weak. Some development occurred but without broad policy support. In one of these regions, there was reluctance to commit to supportive policies.

Looking back at where station-area development occurred since the 1960s, the author noted that downtowns and other in-city locations performed best. The exception was that little station-area development occurred in built-out areas where local communities opposed higher density. In contrast, the author found little transit-focused development around suburban-area stations. A notable exception was Vancouver, B.C., where growth was directed to suburban stations through strong regional planning. In the United States, certain cities (Portland, San Jose, and San Diego) had fomented modest suburban TOD through intensive planning and implementation efforts.

Moving Toward Joint Development: The Economic Development-Transit Partnership
The National Council for Urban Economic Development, Urban Mass Transit Administration, 1989.

This report provides a review of methods and prominent case studies of TJD, concentrating on the links between TJD and economic development activities. It begins with a review of the problems encountered implementing TJD projects and continues with an investigation into the means of attracting private-sector participation in TJD projects, the methods that can help finance the projects, and a review of the steps that should be taken when pursuing TJD.

The first chapter discusses the need to encourage development around transit stations to enhance ridership. The second chapter reviews the historical trends in joint development financing and policy and lays out the crucial policy issues for successful joint development projects, which include issues of fairness in public land acquisition and development and the need to scope joint development projects with the appropriate scale and design to account for real estate market sensitivity and elasticities.

The third chapter reviews the public tools available at the time of the report's publication that could be used to leverage private investments in TJD projects. The report focuses on local government initiatives, including several strategies for reducing the burden of acquiring or paying interest on loans for private-sector TJD partners, like tax-exempt bonding, direct loans, loan guarantees, and loan interest subsidies from local governments to TJD private-sector partners. Other tax-related incentives to entice private developer participation include property tax deductions, abatements, credits, and exemptions. Means to reduce the cost and difficulty of land acquisition and to maximize the financial rewards from the project once completed include tax-deferred land swaps, land assembly, and density bonuses.

Chapter 4 covers the public-private financing techniques that can be used to fund specific project elements. Special assessment districts, tax increment financing techniques, transportation development districts, independent districts or utilities, and developer impact fees, contributions, and exactions can all play an important role in funding site amenities such as transit stations and urban design improvements. Methods that leverage publicly owned lands to encourage private investment include leasing/selling development rights, leasing/selling existing facilities, and negotiated land leases. Numerous and well-detailed case studies are included in this report, particularly in this chapter. Prominent among them is a review of the Cedar Rapids Ground Transportation Center Complex, which demonstrates how TJD can be successful in small communities as well as large urban areas and which can also serve as a seed for local economic redevelopment activities. Examples are also given of systems that have been successful at encouraging transit access agreements that provide means for properties to make direct pedestrian connections to adjacent stations. Prominent examples are Toronto's program, which uses these agreements to generate revenue and where appropriate, no-charge access agreements to encourage TJD.

In the final chapter, the recommended steps to be taken when pursuing TJD are itemized:
1) establish an effective economic development-transportation partnership; 2) identify and coordinate available resources to encourage private-sector participation; 3) identify potential joint development sites and developers; 4) initiate dialogue with developers; 5) conduct realistic market and feasibility studies early on to determine the best use for land; 6) prepare a development program

and plan; 7) negotiate development arrangements; 8) prepare an implementation agreement and obtain public approval; and 9) implement the agreement and the project. The appendix provides detailed summaries of three site visits performed during the research project: Oak Street Redevelopment Project, Buffalo, New York; the Pomona Rail Station and Transportation Center, Atlantic County, New Jersey; and the California/Stout Street Transitway, Denver.

Joint Development: Making the Real Estate-Transit Connection
Urban Land Institute with Gladstone Associates, Urban Land Institute, 1979.

This report, an early publication in the field of TJD research, provides the historical background that allows us to understand how and why TJD efforts were begun and the perspective to understand the challenges TJD projects face today. The report begins with a historical account of TJD projects at the time of its publication, and continues with a set of case studies that illuminate the current state of the practice and how the challenges to TJD were being addressed.

The report provides useful historical perspective on the evolution of TJD projects in the United States. During the 1960s and early 1970s, when new rail transit systems were being planned or built in the United States, transit planners tended to assume that high-density, transit-supportive land uses would spring up automatically around these systems' stations once service began. When looking at the experiences in Toronto and Montreal, these assumptions seemed supported by the course of events there, which seemed to indicate that there was a direct, causal relationship between rail transit facilities/service and real estate development. However, the nuances of this relationship were not well understood. This report concluded that recent transit investments in the U.S. had failed to trigger high-density development as seen in the Canadian examples. However, the main reason for these failures was not due to a misunderstanding of market phenomena, but rather due to a lack of appreciation for and sufficient knowledge in the public and private sectors for the complexities of TJD. In other words, TJD is not a natural product of transit investments, but rather an outcome that can be generated by the initiatives of private and public parties who are aware of and can take advantage of the variety of TJD techniques. At the point of this report's publication in 1979, these techniques were only then being identified and appreciated.

The study's conclusions on the current state of the practice are the result of seven intensive case studies, which include projects ranging from retail and office single-use projects to major mixed-use projects. The case studies were performed on sites in both the United States and Canada to illuminate the differences and similarities between these two national experiences with joint development. The cases include the Gallery, in Philadelphia; 1101 Connecticut Avenue in Washington, D.C.; International Square in Washington, D.C.; Place Bonaventure in Montreal; Washington Street Station in Boston; Park Place in Toronto; and Sheppard Centre in Toronto.

The analysis of these case studies revealed that TJD implementation efforts require two related activities in project planning and development: policymaking and deal making. The planning and policymaking process establishes the basic guidelines that will determine the design and construction of each project and, as such, determines the desirability of said project to private investors. Deal making is the process of bargaining and negotiating the agreements, between public agencies and private developers, necessary to implement a TJD project. Planning and development policies include the coordination of zoning and land-use planning, station location and access considerations, institutional powers and arrangements, and land acquisition and transfer policies. Deal-making strategies and techniques include land assembly, transfer deals, and the provision of public facilities to leverage private investments.

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Section III. Evaluation of Impacts and Benefits

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Land Use Impacts of Transportation Investments: Highway and Transit
G. Giuliano, *The Geography of Urban Transportation*, Chapter 13, 1995.

The author examines land use and transportation connections from a theoretical and an empirical perspective. She finds that both highway and transit investments have only marginal impacts on accessibility at the regional level because even large investments are overshadowed by preexisting transportation facilities. At a microlevel, she finds that the impacts of transportation investments will vary depending on factors such as the availability of undeveloped land, prevailing land-use restrictions, and the state of the regional economy.

Citing the LUTRAQ study as an example, the author argues that land use has little effect on transportation decisions and that transportation demand management (TDM) strategies, such as parking charges and free transit for work trips, are much more effective determinants of mode choice. Finally, the author states that rail investments have had "no systematic influence on urban structure" since World War II. She does, however, cite several studies indicating that where favored development patterns have occurred, the following conditions have been in place: (1) regional coordination of local land use and transit plans; (2) TDM strategies; (3) provision of public infrastructure to support station-area development; and (4) provision of financial incentives to spur station-area development.

Assessment of Changes in Property Values in Transit Areas. Joint Center for Urban Mobility Research, Rice Center, July, 1987.

The benefit of being near transit is expressed, or capitalized, in property values. This report summarizes empirical evidence on transit's land-value benefits based on a literature review and telephone interviews conducted in four cities: Walnut Creek, California (BART); Bethesda, Maryland (Washington Metrorail); Decatur, Georgia (MARTA); and San Diego, California (Trolley).

Commercial and office rents are found to generally increase with proximity to transit, with premiums of 10 percent not uncommon. The public sector has taken limited advantage of increased land values. The greatest land-value increases occur in central business districts. Impacts on residential markets vary considerably. The provision of development incentives by the public sector greatly affects outcomes.

Most of the land-value and rent premiums assigned to rail transit are based on matched-pair comparisons. Examples of land-value premiums are cited for Washington Metrorail, Toronto, and San Francisco BART. Survey results with appraisers, developers, brokers, and leasing agents revealed a general increase in the range of 8 to 10 percent in Bethesda.

Overall, this report concludes that being near transit often leads to higher land prices, though impacts vary considerably among transit system and metropolitan setting. In general, premium effects increase with levels of proactive public-sector involvement.

Joint Development
Sedway Cooke Associates, July, 1984 pp. 16-24.

This early article on TJD provides a broad overview of the concept and chronicles activities as of the early 1980s, particularly related to, at the time, new generation heavy rail systems. A very optimistic perspective is drawn. Studies, for example, are cited that estimate rates of return for joint development projects at Washington Metrorail's New Carrollton and Bethesda stations of 10-to-1 and 40-to-1, respectively.

This article emphasizes the cost savings that can accrue from TJD, related to both utility capital costs and station construction. Washington's Farragut West metrorail station, for example, uses the International Square office and retail project's heating, ventilation, and air-conditioning system. The article also cites studies that, optimistically, estimate TJD could increase ridership by 10 to 15 percent and command up to 10 percent more in rents than similar buildings two blocks away. Shared parking can also increase net leasable space. In view of these benefits, long-term real estate lenders are said to assign credit in their loan evaluations of joint development projects.

Three approaches to TJD are outlined: (1) *the laissez-faire market approach*, mainly involving the private sector taking the lead to maximize profits (BART's Walnut Creek station is cited as such an example); (2) *coordinated approach*, involving the public sector establishing a comprehensive land-use plan prior to station construction that orchestrates private- and public-sector activities (early joint development activities in Washington, D.C., and Atlanta were said to follow this approach); and (3) *project packaging*, wherein the transit agency is more entrepreneurial, seeking to recapture value, temper land speculation, and become an active participant in land development (at the time, there were no U.S. examples, though the authors note that Los Angeles is positioning itself to become proactive in planned station-area development).

Capitalization of Transit-Investments into Single-Family Home Prices
J. Landis, S. Guhathakurta, and M. Zhang. Institute of Urban and Regional Development, Working Paper 619, 1994.

In this study the research team investigated the "rosy view" that rail mass transit investments promote favored land-use forms. The authors focused on five California heavy and light rail systems: BART, CalTrain, San Jose's light rail system, Sacramento's light rail system, and the San Diego Trolley.

The study methodology relied on a hedonic price model to determine if and under what circumstance transit accessible locations command price premiums. The authors' major findings include the following:

- "Capitalization effect of rail transit can be significant" (pg. 31). In Alameda County during 1990, for every meter closer to a BART station, homes sold at a price premium of an additional $2.29.
- Proximity to freeways was not positively capitalized into home values. In two counties, Contra Costa and San Mateo, and in the city of San Jose, effects were actually negative.
- The extent to which transit accessibility is capitalized into home value depends on the quality of transit service and the level of service of other modes of travel.

The authors conclude with a discussion of policy implications. They note that while capitalization effects of transit service are significant, the effects are too small to generate higher density residential development on their own. As such, they indicate that supportive land-use policies, including development subsidies or incentives, will be necessary to promote higher-density housing in many locations. The authors conclude by suggesting that capitalization effects present a potential funding source for transit agencies through the use of value-capture techniques. In particular, they point to Denver and Los Angeles, both of which have experimented with benefit-assessment districts.

Section IV. Implementation

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Construction of Transit-Based Development
S. Lefaver, B. Buys; D. Castillo; S. Mattoon; & J. Vargo, The Mineta Transportation Institute, Report January 5, 2001.

This report provides an overview of the policies and procedures that can be used at the federal, state, and local levels that promote TOD. Examples and case studies of transit-based development are given, as well as a set of recommendations on the land use, legislative, and fiscal means that are needed at the local level to leverage TOD.

The report begins with a review of the current federal incentives for transit-based development. These include the Transportation Equity Act for the 21st Century's Enhancements program, the Livability Initiative, and the flexibility in federal transportation funding given to regional and local governments that allows the use of gas tax funds for transit-oriented development-related projects. A host of other funding sources have also been coordinated from various sources within the federal government under the Livable Communities Initiative, potentially offering further financial assistance to transit-based development projects. The report also reviews a number of legislative initiatives and programs at the state and regional levels in California that provide incentives to transit-based development. Prominent among the state legislation is the Transit Village Development Planning Act of 1994 (AB 3152) that encourages local governments to establish "transit village development districts." Attention is also paid to state bills that were not adopted or were so altered as to reduce their effectiveness at supporting transit-based development. Key among these is Assembly Bill 779, which, if adopted in its original format, would have forced cities and counties to adopt land-use policies that would encourage development in transit corridors. Since it was rejected by the legislature, it has been revised and passed with a new focus on providing money to cities and counties that wish to develop growth policies and programs in neighborhoods that need revitalization, and without the mandates contained in the original bill. The first section concludes with an overview of regional programs in the San Francisco Bay Area that encourage transit-based development such as the Metropolitan Transportation Commissions Transportation for Livable Communities program.

The second section provides case studies of successful transit-based developments in California cities such as San Jose, Mountain View, San Francisco, Los Angeles and San Diego, as well as Portland, Oregon. This section also provides an overview of the local and regional governments' policies and programs used to encourage these projects.

The third section provides a set of recommendations for federal, state, regional, and local governments that would further encourage transit-based developments. Recommendations include (1) expanding the enterprise zone (EZ) concept to include areas near transit stations as being eligible for designation as an EZ; (2) expanding the pool of candidates eligible to participate in receiving welfare exemptions to include for-profit developers to encourage the construction of low-income housing; (3) aggressively using redevelopment agency powers to encourage transit-based development; (4) changing the evaluation criteria in California for receiving tax-exempt private activity bonds to give more weight to transit-based projects; (5) establishing criteria for the California Tax Credit Allocation Committee (TCAC) to favor residential projects within transit-based developments when deciding on the recipients of low-income housing tax credits; and (6) allowing the environmental review for any infill development in an urbanized area to be addressed by a general plan environmental impact report (EIR) or specific plan EIR instead of requiring a separate and time-consuming project-level EIR. Recommendations are also made for local and regional governments based on the case studies provided in the previous section. The

authors conclude with observations about the factors that led to success in the case studies. In each successful case, local governments were the primary actors, providing the primary stimuli that made these projects successful. Each jurisdiction focused on three main elements:

- Taking an active lead in the land-use process;
- Encouraging the private sector to develop appropriately with incentives and assistance; and
- Using state and federal programs to foster development beneficial to the community.

TCRP Legal Research Digest 12: The Zoning and Real Estate Implications of Transit-Oriented Development
S.M. White, & J.B. McDaniel, Transportation Research Board of the National Academies, 1999.

This article reviews the legal and procedural issues associated with the implementation of TOD, and presents the results of a national survey of nearly 300 transit agencies on their involvement in TOD activities. It begins with a review of the methods used for regulating development within transit station nodes and corridors. Such methods include (1) density and use regulations; (2) bulk, setback and area controls; and (3) street patterns and parking restrictions. The study continues by widening the scope of potential tools and methods for encouraging TOD to include what the authors label "ancillary techniques," a category that includes urban growth boundaries, the tier system of regional planning, transportation corridor planning, joint development, concurrency, and the transfer of development rights.

The first section of the report provides a review of the procedures for implementing TOD. These procedures include specific plans, which are most useful in states such as California, Florida, Oregon, and Washington, which require consistency between land use and comprehensive plans. The authors propose that transit agencies can take a lead role in crafting specific plans that encourage TOD around station areas. Planned unit development (PUD) designations are also listed as a procedure that can be used to achieve the design flexibility needed to promote TOD development, even though they are most frequently used for automobile-oriented, suburban development. Specifically, PUDs can be useful because they allow local governments increased flexibility to control development at a fine-grained level of detail. The report also promotes the use of development agreements between local governments and developers that formalize tradeoffs between the parties. For example, local governments may be willing to freeze land-use regulations on a particular property in return for the developer paying for public infrastructure that will enhance the parcel's role as a functional part of a transit-oriented urban space. Similarly, capital improvement plans can be crafted to include projects that will enhance the pedestrian orientation of station areas and can be timed to complete capital improvements in sequence with private real estate developments so as to maximize the mutual TOD impacts of both.

The article also reports on the results of a national survey of approximately 300 transit agencies nationwide. Of these agencies, the authors report that only a handful were found to be actively involved in TOD projects. Of those involved in TOD projects, the most commonly reported regulatory techniques were mixed-use zoning, density increases, and added transit-supported land uses along transit rights-of-way. The researchers also recorded the use of density bonuses, impact fees, density transfers, transfers of development rights, modified street standards, tax abatement, and the use of concurrency, though only in states with concurrency laws.

From this survey, the authors conclude that in general, California and Oregon lead the way in the use of TOD. As of the article's publication, the San Diego MTDB reported the most extensive use of TOD, with 18 joint development projects undertaken, producing over 3.7 million square feet of commercial retail, office, and industrial space, as well as 1,981 dwelling units, using a combination of density bonuses, mixed-use development, and pedestrian-oriented urban design. Similarly, Tri-Met in Portland has produced more than 3,595 dwelling units and over 650,000 square feet of non-residential floorspace through the use of TOD comprehensive plan and zoning code amendments. The Santa Clara Valley Transit Agency has used TJD practices to promote housing along light rail transit lines. "Trandominiums" are being built on park-and-ride lots through long-term ground

leases to developers. The Sacramento Regional Transit District is reported as being one of the few agencies that is using modified street standards in its TOD policies. In King County, Washington, the County Department of Transportation has used mixed-use zoning, density bonuses, density transfers, transfer of development rights, and concurrency to encourage TOD. They also offered the city of Bellevue up to 10,000 extra bus hours over two years if employment could be increased in the downtown area and new developments could be built with reduced parking requirements.

In the final section, the authors review the legal basis for TOD. Based on the national survey, they conclude that there has been no reported litigation of TOD projects. Furthermore, they report that the U.S. Court of Appeals has affirmed that the use of traditional neighborhood development principles is a legitimate application of local governmental land-use controls. The report provides an overview of the legal issues relevant to land-use controls in general, including takings, zoning authority, environmental impacts and reporting, TJD and redevelopment authority, and comprehensive plan consistency.

Planning for Joint Development in Los Angeles
J. Gilson and F. M. Francis, *Urban Land*, pp. 30-32, June 1993.

This article looks at the Los Angeles Metropolitan Transportation Authority's (MTA) efforts to leverage its investments in rail transit through joint development. The author identifies MTA as the first agency to devote the necessary resources for joint development at rail stations, noting that at the time the article was written, MTA was considering 80 station sites.

MTA's approach to joint development focuses on station-area master planning. The author indicates that MTA prepares these plans with local businesses, landowners, and residents. This planning process can be an impetus to changing local land-use regulations when necessary.

Among the tools MTA has to implement its master plans are ground leases of MTA-owned property, air rights transfers, relocation or addition of station portals to articulate with surrounding development, financial incentives such as loan guarantees, access to telecommunication infrastructure, and "knock-out panels" designed to provide access to stations by future developments. The article also discusses the how the presence of air-quality regulations aimed at reducing auto use have helped MTA, for instance, by limiting the number of parking spaces at new downtown office developments.

The article explores the station planning effort at the Sunset-Vermont subway station in Hollywood in detail. Here the author credits MTA's ability to cooperate with the private sector in land acquisition and parcel assembly as well as its ability to provide underground pedestrian passageways to link a large development as important incentives to implementing its station-area master plan.

The article concludes with a number of policy and implementation questions that concisely phrase the dilemmas faced by MTA (and transit agencies in general) in their participation in joint development projects.

Transit-Oriented Development Case Studies, City of Seattle, Strategic Planning Office, August 1999.

In order to inform its station-area planning efforts, the City of Seattle Strategic Planning Office conducted a study of TOD projects in a dozen North American cities. These cities were chosen because of the similarity of their light rail station types or physical setting to Seattle, or because of their use of certain implementation tools that were of interest to Seattle.

The report consists of 12 analytical case studies with a summary list of overall findings and recommendations. Several of the findings are listed below:

- Station-area planning is best conducted through comprehensive planning that includes "zoning, public improvements, development financing packages, and effective marketing programs";
- Station-area planning has worked well when done locally and tailored to the needs of the surrounding community;
- Parking management and shared parking "make transit-oriented development viable";
- "Upzoning" and reduced parking requirements help attract TOD and may provide adequate incentives in areas with "limited land, intensive existing development, and a strong local economy," though they "may be insufficient for other areas";
- Expedited development review such as "fast-track," specific plans, or planned unit development provisions can promote development around station areas;
- Cities can use successful demonstration projects to build political support for TOD and TJD; and
- Public assistance performed by redevelopment agencies, including land assembly and financing, can be helpful. Also, public investments such as street beautification can serve to induce further investments.

The rail systems studied were Atlanta MARTA, Denver RTD, Los Angeles Metro, Portland MAX, Sacramento Light Rail, San Diego Trolley, San Francisco BART and MUNI, San Jose Light Rail, Vancouver BC Sky Train, and Washington, D.C., Metro.

TCRP Report 31: Funding Strategies for Public Transportation: Volume 2: Casebook, Price Waterhouse LLP, Transportation Research Board of the National Academies, 1998.

This report provides case studies of funding mechanisms for the nation's transit systems that, over the past few years, have been struggling to maintain services in an environment of shrinking federal funds and increasing unfounded federal mandates. Overall, the casebook is divided into two sections. The first provides examples of transit systems that have tried to fill this funding gap through a number of external funding sources and initiatives. These include five types of case studies: (1) dedicated local taxes; (2) transit impact fees; (3) creative use of federal funds; (4) state infrastructure banks; and (5) revolving loan funds. The second section describes agency-generated funding examples. These are generally described in three subsections: (1) capital expenditures, which look at creative ways to fund vehicle purchases and the construction and rehabilitation of physical transit system structures; (2) fare revenue enhancement, where transit agencies have used inexpensive measures to enhance farebox revenues; and (3) the creative use of transit assets, where agencies have marketed their assets to attract private-sector funds.

The section on joint development (JD) highlights the programs and activities of two transit agencies: the Washington Metropolitan Area Transit Authority (WMATA), serving the Washington, D.C., metro area, and the Metro-Dade Transit Agency (MDTA) serving the Miami metro area. WMATA provides a profile of an agency with a "mature" set of joint development practices, since they have been undertaking such projects since the 1970s. MDTA's joint development program is much smaller and provides insights for transit agencies that want to establish a joint development program.

WMATA pursued joint development while constructing the Metrorail system in the 1970s. As of the time of the report, there were projects at 15 stations. The agency actively encouraged joint development projects for selected stations, using land leases, air rights development agreements for stations, and cost-sharing agreements with surrounding properties/developments on non-WMATA land. During the acquisition of land for the construction of the rail system, WMATA purchased land anticipated for future expansions. The purchases were funded from three sources: (1) direct congressional appropriation (two-thirds federal and one-third local match); (2) bonds; and (3) Stark-Harris Funds. Since these funds did not come from the federal transit agency, none of the money had to be returned if not directly used for transit and WMATA was relatively free to engage in joint development activities.

A pivotal joint development project for WMATA was in the mid-1970s when a developer approached WMATA for a land lease to construct a building over Farragut North station. This office and retail complex, with no parking, generated $600,000 per year for WMATA in 1998, and was projected to increase to $1 million in 2000. Because of this project, other developers became aware of the value of developing near the Metrorail system stations.

WMATA focuses on the following criteria when evaluating developer proposals: (1) the financial viability of the project; (2) the effects on ridership; and (3) the amount of revenue generated for WMATA and the local jurisdiction. As of 1998, the agency collected almost $6 million in joint development revenues each year. Overall, downtown developments have 60-percent transit mode share and suburban developments have a 25-percent transit mode share. Research shows that a 20,000-sq.-ft. downtown office building annually generates 300,000 trips and $500,000 in revenue to WMATA.

In the case of Miami's heavy rail system, the MDTA is a department within Dade County government. During construction of the system, MDTA purchased excess land around stations, and in 1978, Dade County established a rapid transit zone along the entire length of the heavy rail system. In this zone, the county controls surrounding land uses and includes local jurisdictions in development negotiations. The county then created the Office of Leasing with five staff to manage and market joint developments.

The report describes two station areas where joint development activities have been underway: Dadeland North and Dadeland South. In the case of the Dadeland South project, the developer and the county conducted a land swap where the developer gave land to MDTA in exchange for rights to develop a hotel, offices, and retail stores at the site. The developer also paid for and built a parking garage, where MDTA owns 1,000 spaces and the other 650 are used by the offices. At Dadeland North, in 1994 the developer signed a land-lease contract that runs for a 99-year lease term. All phases of the project must be completed within the pre-specified timeframe, or a penalty kicks in. At Dadeland South, the first agreement, MDTA didn't include penalties for finishing late, and the slowness of phase completion meant a loss of income for MDTA. At Dadeland North, if any phase is delayed, the developer must pay $20,833 per month, indexed to inflation. Leases are for a 99-year term and the MDTA receives the greater of a minimum rent or a percentage of gross profits.

Further problems that were encountered in the Dadeland South experience were corrected at Dadeland North. At Dadeland South, the developer sold the development rights to a third party and made a profit. The MDTA did not get any of this profit. The Dadeland North contract specifies that MDTA will receive 5 percent of such sales. Overall, the lessons learned are that joint development can bring benefits in the form of (1) local tax and transit system funds; (2) density at stations; and (3) increased ridership. Often overlooked is the fact that joint development can increase local tax revenues as well. Dadeland North is expected to generate $1.3 million in local tax revenues. This is over 3 percent of total general tax revenues.

Promoting Transit-Oriented Development
D. Salvensen, *Urban Land*, July, 1984, pp. 31-35, 87.

Transit stations are often viewed as under-exploited assets. This article argues that for nearby private investment to occur, there needs to be a combination of supportive public policies and favorable market conditions.

The article also provides a general overview of transit's history and cites the views of a number of professionals in the field, such as "transit doesn't induce development as much as shape it." Anecdotes are generally relied upon to describe all of the planning inputs to encourage TOD, but no outcome statistics are presented.

Early experiences with joint development are thought to have dampened the city of Dallas's enthusiasm for station-area development for the then-just-opened Dallas Area Rapid Transit (DART) system. The developer of the City Place twin-tower project offered to share costs for station construction. However, once the market softened, the developer withdrew the financial support, leaving doubt over whether the partially completed station would open.

Barriers to TOD are outlined in the article, focusing particularly on in-grained opposition to land-use changes (particularly densification) in established residential neighborhoods. The article ends on an optimistic note, contending that transit agencies, regional planning bodies, and local governments all around the United States are actively promoting integrated transportation and land-use planning. How future TOD efforts might overcome past barriers is left unsaid.

Joint Development Entrepreneurial Study: Final Report Prepared for: Bay Area Rapid Transit
Sedway Kotin Mouchly Group, Bay Area Rapid Transit District, 1996.

This report was undertaken under contract to the Bay Area Rapid Transit District (BART) to make recommendations on how to improve its joint development program. Established in the mid-1980s more than 10 years after the start of system operations, the joint development program had not been as successful as anticipated. The consultants undertook a survey of 13 transit and other governmental agencies nationwide that were thought to have successful joint development programs. The study primarily reviews the institutional differences between BART and the surveyed agencies and draws conclusions about how these differences have affected the outcomes of joint development projects for these institutions.

In this study, the institutional arrangements at several levels of government—within BART and other governmental agencies—are the most important reasons why BART has not been successful at joint development projects beyond simple ground leases. These institutional problems are also responsible for the lack of TOD around BART station areas in general. A significant handicap for BART is its limited mission as an operational transit service, and not as a development or redevelopment agency. Without the legislation that supports this role, BART suffers from a lack of institutional legitimacy when undertaking joint development projects. The authors specifically recommend that the agency seek amendments to its statutes similar to the Los Angeles Metropolitan Transportation Authority (LAMTA). This would allow BART to engage in land acquisition beyond what is needed for system operations, confer the power of eminent domain, and permit tax-exempt bonding and other financing mechanisms.

The researchers also found that all the successful public/private entities studied have an appointed board that either runs the agency or serves as an advisory board to the elected officials who run the agency. This appointed board often has significant private industry representation, often with expertise in real estate. Such a board within BART could function as a facilitator between the transit agency and private interests to encourage joint development projects in a manner similar to the entity that worked to implement San Diego's City Centre Development.

Another problem identified by the research team is the dominance of local governments over land use; an arrangement that often precludes consideration of the regional benefits to traffic and sprawl containment that TOD and joint development projects offer. To overcome this problem, the study recommends that BART seek amendments to its statutes to allow it to enter into joint powers agreements (JPAs) with local governments and redevelopment agencies to do joint development and TOD projects within a third of a mile of BART property. At the state level, the study recommends that BART seek legislation similar to Oregon's House Bill 3133 that would allow local governments to provide property tax abatements for multi-family housing built near transit.

The study recommends that all transportation funding agencies revise their funding criteria so as to require that local governments show they have made commitments to transit-supportive land uses as a condition for siting a transit station there. These agencies should also revise their existing definitions of transportation projects to include property acquisition and station-area planning for joint development projects.

The study also includes a review of assessment of joint development potential at BART stations.

Market Opportunities and Barriers to Transit-Based Development in California
R. Cervero, M. Bernick, & J. Gilbert, Institute of Urban and Regional Development, No. 621, 1994.

This report analyzes the opportunities and barriers to transit-based development in California. Since housing construction near transit stations was sluggish at best at the time of this publication, significant attention is given to the reasons for this and measures that can be taken to improve the prospects for transit-based development. Attention is also given to the opportunities for transit-based development in California.

Opportunities mentioned include shifting market-demographic trends, where more young households, empty-nesters, and childless households in California increase the potential pool of interested TOD residents. Increasing shortages of affordable housing also increases market pressures for high-density development. Transit agencies also possess money and land that provide opportunities for transit-based housing. These assets can be used to leverage private investments. Land assembly through land banking, eminent domain, condemnation, or redevelopment acquisition all help lower the costs of development and are noted as important tools to transit agencies to attract transit-based development investments. Ballston Station in Arlington, Virginia, is given as example of how development of a station parking lot can spur private investments and redevelopment of the surrounding area.

Private investments can also be attracted through cost-sharing mechanisms, where parallel costs of developing transit facilities and private real estate projects can lower the total costs of development. Construction costs for heavy equipment, foundation work, utilities, equipment staging, storage areas, parking structures, and ventilation systems, among others, are all listed as potential areas for burden sharing. From 1980 to 1990, around $71 million in private capital contributions were shared in TJD projects around the United States. Institutional and regulatory opportunities—such as specific plans, which allow local governments to implement tax-exempt financing, zoning, redevelopment powers, density bonuses, impact fee credits, and reduced parking requirements—are also mentioned. Empowerment zones and enterprise communities are cited as tools that could be used to encourage transit-based development in inner-city areas in need of investments. Livable communities set-aside grants from the FTA could also be employed for improved access for residents in distressed areas.

This report also places emphasis on the barriers to transit-based development in California. The report lists several obstacles in particular, such as the difficulties associated with land assemblage, neighborhood and political opposition to higher densities, and the inability to secure financing. Economic barriers include questionable market viability of high-density housing due to a historical preference in California for single-family detached housing, as well as the difficulties in attracting residents since transit often does not compete well with the automobile in terms of travel time. Land and construction costs also increase with increasing proximity to transit stations and increasing densities, respectively, making transit-based housing less financially attractive to home buyers. Additional obstacles can be found in the lack of available land, unsuitability of available land, and problems due to the lack of prototypes of transit-based development.

Benefit Assessment District Financing for Transit Projects
B. Darche and K. Curry, *PTI Journal*, March/April, 1990, pp. 10-12.

This article, written as part of a policy program to promote benefit-financing of Los Angeles's Metrorail System, argues that benefit assessment can be critical toward securing bonds that are backed by a guaranteed stream of assessment revenues. Based on a review of the literature, the authors contend that the assessed value of properties in the assessment district should be at least three times the bond par amount.

Darche and Curry note that rail projects have historically used a broader definition of benefits to secure bond funding than traditional bus transit services. In addition to increased property values, other potential benefits that need to be weighed include lease premiums, increased retail sales, higher hotel revenues (and related occupancy tax proceeds), and employer parking cost savings. These benefits were computed in designing benefit assessment districts (BADs) in Los Angeles and Miami.

The article also provides pointers on implementing a BAD. Based on experiences with bus transit malls in Denver and Minneapolis, the authors note that BADs should extend at least two blocks beyond the transitway corridor. Los Angeles's downtown BAD extends about a half-mile from rail stations; Miami's assessment district for its downtown people-mover extends approximately a quarter mile out.

In most transit BADs, the assessment rate is based on the required level of annual capital or operating and maintenance expenses needed for the proposed improvement. For capital improvements, the typical funding mechanism is to issue benefit assessment bonds to amortize the capital cost of the facility over a 20- to 30-year period. Assessments are collected every year until the bond is retired.

Revenues from assessment districts can also fund operations, a strategy considered by the city of Honolulu. In order for non-capital assessments to gain popularity, however, property owners need to be convinced that transit confers real and sustainable economic benefits, to both their own parcels and the region at large.

NTCRP Report 12: Strategies to Implement Benefit-Sharing for Fixed-Transit Facilities
J.A. Howard; G. Rivkin; S. Brecher; & L. Heder, Transportation Research Board of the National Academies, 1985.

This report describes benefit sharing, a collection of methods and techniques to share the costs and benefits of transit facility construction, rehabilitation, and operations between public and private interests. Case studies are provided to illuminate the issues surrounding implementation of benefit sharing measures.

Value capture methods offer the transit agency a financial return on the benefits that the agency provides to property owners. Value capture revenues can be stretched out over time, as opposed to a joint development or wholly transit-agency-funded development near a station, which requires significant up front costs and entails financial risk for the transit agency involved.

At the time of this report's publication, most of the transit agencies that had engaged in benefit sharing had done so in connection with the construction of new transit facilities. Shortages of public funding led transit agencies to focus on increasing private-sector investments/funding. This led to a higher level of interest in benefit sharing to fill the funding gap. In the 1960s, most thinking about the subject focused on the examples of Toronto and Montreal, whose institutional arrangements allowed transit authorities to assemble land around stations and to capture some of the increases in land values as a result of the transit systems' presence. This method did not catch on in the United States, since there were institutional and legal issues raised by transit agencies acquiring excess land around stations. Alternative proposals in the 1970s turned to setting up station-area development authorities that could be created by state or local governmental authority or could be set up as public corporations. While these development corporations were successful in Baltimore's Lexington Market station, the Bethesda, Maryland, case study in this report illustrates legal and institutional impediments to this type of arrangement. At the time of this report's publication, focus had turned back on the transit agency to take the initiative on generating revenues from benefit sharing. The concept of benefit sharing was expanded in this era to include a wider range of partners, investors, and beneficiaries and implies a more complex intervention in the development process than the older concepts. The focus had shifted to exploiting the real estate that the transit agency already owned as opposed to acquiring new parcels.

The major ingredients for success at the report's writing were noted as (1) support from the transit agency's general manager to expand the scope of the agency's activities/role; (2) an "entrepreneurial spirit" on the part of the transit agency; (3) the availability of real estate and finance expertise to assist the agency; and (4) an openness to cooperating with local agencies and developers.

The report's major recommendations are (1) review the opportunities for benefit sharing within the transit agency as the first step to see if currently owned assets can be exploited; (2) establish an appropriate, continuing mechanism within the organization for pursuing benefit sharing; (3) incorporate benefit sharing into ongoing planning and implementation; (4) deal with the private sector in a businesslike fashion; (5) recognize the importance of design details, phasing, master planning, construction coordination, and a high level of maintenance to benefit sharing; (6) relate benefit measurement to the level of planning required and to the benefit-sharing strategy involved; (7) be realistic in evaluating the financial return to be achieved through benefit sharing—benefit sharing can only cover a small portion of system costs.

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Section V. Urban Design

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Transit-Oriented Development in Four Cities
G. Ohland, Presented to the Partnership for Regional Livability, The Great American Station Foundation, 2001.

This paper reviews the progress of TOD efforts in four metropolitan areas of the United States: Atlanta, San Francisco, Chicago, and Denver. Each provides unique insights into the successes and pitfalls associated with TOD. The paper's author analyzes these cases and provides lessons learned to guide future TOD efforts.

Atlanta has had great success at focusing new development around the MARTA heavy rail system. According to Leon Eplan—a consultant with Parsons-Brinckerhoff for Atlanta during the 1970s—Atlanta did a good job of early station-area planning and zoning to attract development, but people misunderstood the importance of the real estate market. Consequently, while Atlanta's MARTA stations have been very successful at attracting office development, there has not been a viable market in station areas for residential development. As a result, MARTA station areas suffer from what Jeff Rader of the Atlanta Homebuilders Association calls, "dysfunctional density," where early zoning decisions for high density around stations has served to inflate the local real estate market. Now, only office and other high-value commercial properties can successfully bid for these properties, and MARTA station areas suffer from a lack of land-use diversity. Ohland found that most locals do not consider these "mega-projects" as examples of successful TOD, but rather point to older neighborhoods like downtown Decatur, where development has happened over time through a more organic, evolutionary process.

In the San Francisco Bay Area, Ohland points to the successes of the Metropolitan Transportation Commission's Housing Incentive Program (HIP) and inclusionary zoning practices, both of which serve to encourage transit-oriented affordable housing. While these practices encourage the non-profit sector to build around transit stations, Ohland also points out the pitfalls of relying on affordable housing programs to generate TOD projects. These complex projects often try to coordinate for-profit and non-profit participants, partnerships with inherently conflicting goals. Non-profit projects trying to build on transit agency land also run up against problems securing financing since they cannot put up the land as loan security, a common practice in development lending.

In Chicago, Ohland found an urban environment where TOD has always seemed to occur naturally. However, a new wave of redevelopment is converting formerly urban areas to suburban uses, while mega-projects like those seen in Atlanta threaten to create large, high-density development without any diversity or urban character. Here, too, local planners are focusing on how to encourage a more organic approach to TOD, building on the preexisting neighborhood's assets.

Denver provides another example of an area experimenting with the idea of evolutionary TOD. Here, the downtown's 16th Street Mall and the LoDo loft district are leading the way toward becoming a pedestrian-friendly, transit-supportive environment. In just two years, the downtown has gone from a 20- to 25-percent transit mode split for work trips to 35 percent. Outside the downtown area, the region is struggling with sprawl and auto-dependency, but rather than trying to convert large areas wholesale into TODs, places like the Englewood City Center are experimenting with attracting development by building in an auto-dependent manner, but doing so in a way that allows easy conversion to a TOD later. By placing buildings on the street and parking in the center of the lots, the large amount of parking spaces can be replaced later with infill development that makes a more comfortable pedestrian environment.

In terms of lessons learned, Ohland suggests that TODs can be encouraged by pre-approving station areas for TOD uses and calls for the development of a range of TOD prototypes that would be suitable for different station area types. She also suggests that each region compile a list of financial institutions that are willing to fund TOD projects.

Asking Transit Users About Transit-Oriented Design
R. Ewing, *Transportation Research Record 1735*, Transportation Research Board of the National Academies, 2000, pp. 19-24.

In his article, "Asking Transit Users About Transit-Oriented Design," Reid Ewing argues, "designers tend to impose their own taste instead of user (client) preferences, or at best they tend to make naïve assumptions about user preferences" (p. 19). As an alternative approach, he examines one way in which transit-oriented design might be reconsidered in light of user taste: visual preference surveys. Though the article is very limited in scope, it is notable for introducing a potentially powerful tool that might improve community engagement in TOD design processes and improve the quality of TOD design.

By the author's estimation, the Florida Department of Transportation (FDOT) was the first agency in the country to prepare a TOD design manual that incorporates the results of visual preference surveys. The FDOT survey allowed individuals to rate pictures of various transit stops from throughout the state. The pictures were coded according to whether they showed characteristics such as furniture, sidewalks, or vehicle turnouts. Though the survey used only 15 participants, the study yielded some statistically significant results. Namely, it was found that the ratings people give bus stops is affected by the following features, in descending order of importance:

- The presence of a bus shelter,
- Trees along the street leading to the stop,
- The setback of the stop from the street edge,
- The location of the stop at an intersection, and
- A vertical curb at the stop.

While these results of the FDOT visual preference survey generally conformed to the literature on transit-oriented design features, the author points out that they served to illuminate the relative importance of urban design features.

Related Research: VIA in San Antonio conducted a visual preference survey for transit, the results of which may be viewed at http://www.viainfo.net/planning/visual_pref.html.

Creating Transit Station Communities, Puget Sound Regional Council, June 1999.

Subtitled *A Transit-Oriented Development Workbook*, this report from the Puget Sound Regional Council is intended to be a pragmatic, how-to guide for local governments in the Seattle region. It draws from the literature on TOD design and supplements it with information about real estate market analysis and implementation strategies. One of the most useful portions of the report is a detailed appendix that explains how to conduct a regulatory audit to ensure that a jurisdiction has a transit-supportive development code.

The initial section of the report focuses on the design elements of TOD. It lists important considerations and provides design parameters that are sensitive to local factors such as the quality and type of transit service and the character of the surrounding neighborhood. Among the standards and suggestions included in this section are the following:

Density

- Employment densities of 25 jobs per gross acre to support frequent high-capacity transit and 50 jobs per acres to support light rail services.

Pedestrian Access

- Keep block lengths short: 1,200 feet on average with a range of 800 to 1,600 feet.

Building Orientation

- Locate stores according to their need for parking, pedestrian pass-by, and visibility. Place anchor stores along arterials and at the entry to stations, and local stores and businesses along pedestrian streets.

Parking

- Adjust parking standards to achieve commercial floor-area ratios (FARs) of approximately one or higher.

The second section of the report addresses how to perform market analyses. The authors advocate performing studies at three levels: regionally, along corridor segments, and at the station area. These studies are intended to inform public policy and to be used in marketing to prospective developers. Among the data to be collected are macro-level demographic and economic trends, information about the comparative advantage of various corridor segments, and station-area specific data such as land availability by zoning.

The final section of the report addresses implementation strategies broadly grouped into three categories:

- Permits and regulations,
- Funding sources to leverage private investment, and
- Proactive public actions to promote TOD to the development community.

Planning for Transit-Friendly Land Use: A Handbook for New Jersey Communities, NJ Transit, Federal Transit Administration, 1994.

New Jersey Transit created this handbook for local officials, planning staff, community representatives, and individual citizens interested in improving the relationship between land use and transit planning. Like most transit agency TOD design guidelines, this handbook discusses the appropriate mix of land uses around transit stations, ways to encourage pedestrian and bicycle access to station areas, and appropriate treatment of vehicular access, circulation, and parking. In addition, this handbook focuses on ways to create a sense of place around transit stations and includes sample implementing ordinances.

In addition to discussing densities and distances from transit stations, the handbook adds to the discussion of the appropriate land-use mix in station areas in a few ways. First, it encourages mixing land uses to achieve a balance of peak and off-peak trip generators (e.g., mixing office and entertainment uses). Second, it encourages land uses that complement one another and complement the type of transit service provided. For instance, at park-and-ride lots, the handbook suggests clusters of uses such as day care, convenience stores, dry cleaning businesses, pharmacies, and auto service shops. Finally, it points out that the appropriate mix of land uses in a station area should be informed by existing and planned development adjacent to the station area and suggests the use of zoning to limit competing retail centers where market demand is insufficient to support multiple centers.

With regard to circulation and access, the handbook advocates techniques to facilitate intermodal transfers, including shortened distances between transit stops and transfer points. The authors indicate that such distances should not be greater than 660 feet (one-eighth of a mile) and preferably less than 250 feet. For parking, the authors recommend reducing the number of allowed spaces according to a schedule that takes into account proximity to transit, type of transit service, and type of land use. Near major multimodal transit hubs, the authors advocate 60-percent parking reductions for commercial uses and 25-percent reductions for residential use.

The handbook contains a chapter on the relationship of transit stations to their surrounding communities. The authors argue that transit stations encourage ridership when they are "visible points of identity." To accomplish this sense of place, they advocate the establishment and protection of visual corridors, which lead into transit stations and link to key landmarks in station areas. They also support the use of attractive and well-maintained open space to serve as a "forecourt" for transit facilities and to support the activities generated by surrounding land uses. Finally, the authors discuss the importance of 24-hour uses such as taxi stands, police stations, and all-night delis as well as public uses such as libraries, post offices, government centers, and educational facilities. These uses are intended to provide a sense of security and surveillance, while helping to establish the transit station as an activity center and create opportunities for trip linking.

Transit-Supportive Development in the United States: Experiences and Prospects
R. Cervero, Federal Transit Administration,
DOT-T-94-08, 1993.

This study contains a definition of transit-supportive developments as those developments that, by design, prioritize the needs of transit users and pedestrians. Its purview is primarily the suburban and exurban communities of large U.S. cities, where transit is principally provided by bus. The study focuses on the impacts of transit-supportive developments on transit demand. It also examines examples of bus-only transit-supportive suburban developments, of which few examples were found at the time of its writing. As such, the author also examines obstacles that have stood in the way of such developments and considers the policy environment in which these developments exist.

A section of particular interest is the author's assessment of good practices in the development of land-use and design guidelines by transit agencies through the United States and Canada. The report summarizes agreed-upon standards for land use and site design, addressing the following topics:

- Land-use mixture;
- Desirable densities;
- Pedestrian circulation;
- Placement of buildings;
- Street patterns;
- Parking;
- Road geometrics (turning radii, road widths, pavement depths, etc.);
- Landscaping and other site amenities;
- Transit shelters;
- Bike storage;
- Safety; and
- Accessibility for people with disabilities.

The Next American Metropolis, P. Calthorpe, Princeton Architectural Press, 1993.

The author begins this book with an agument for a new form of metropolitan growth. He criticizes auto-centric development on cultural, economic, and ecological grounds and proposes that the transit network and a series of TODs serve as the building blocks for urban growth and change.

After providing the rationale, the author provides guidelines for new regionwide land-use patterns and specifically for the design of TODs. In the "Next American Metropolis," TODs are to be characterized by comfotable walking distances, excellent pedestrian connections, and mixed uses, including retail, office, residential open space, and public uses. The author distinguishes between urban TODs and neighborhood TODs. The former are located along regional express transit stops and are typified by high commercial intensities, job clusters, and residential densities averaging 15 dwelling units per acre. The latter are located along feeder bus lines and are typified by residential densities averaging 10 dwelling units per acre with service, retail, entertainment, civic and recreational uses that are local-serving. The author also distinguishes between TODs in existing and new growth settings. TODs in existing neighborhoods must complement the surrounding community, while TODs in new growth areas must be able to function without transit service, which may not be extended for some time.

The book provides specific guidelines for core commercial areas, residential areas, public uses, street systems, and parking. In addition, there are guidelines for secondary areas, which are lower-density areas that surround TODs and are distinguished from conventional subdivisions by an interconnected street pattern, the accommodation of some employment, and an emphasis on links into the mixed-use TOD. Secondary areas are an integral part of Calthorpe's regional vision and would actually be the majority of the space in his next American metropolis. Secondary areas, the author argues, should contain auto-intensive uses that are incompatible with the design of TOD, but should not include retail uses that compete with the core commercial area and draw vitality away from transit.

The discussion leads into the topic of the distribution of TODs. Calthorpe proposes that TODs be located to maximize access to their core commercial areas from surrounding areas that rely on arterials. He also advances the principle that TOD spacing should be informed by the market area of the retail uses in the commercial cores. For instance, he notes that a one-mile spacing guideline will be appropriate in some instances, as this is the market area necessary to support a grocery store.

The New Suburb
H. Rabinowitz and E. Beimborn, University Research and Training Program, DOT-T-91-12, 1990.

This study looks at innovative suburban development proposals that incorporated transit-sensitive design. From among a pool of 34 potential projects that were identified, the study highlights 10 "exemplars." These exemplar projects are explicitly meant to inform the practices of real estate development and planning.

Projects are evaluated with regard to three major areas: (1) land use, (2) accessibility to transit, and (3) compatibility with transit operation. In particular, 10 specific criteria were identified upon which the projects were analyzed.

Drawing lessons from exemplars, the authors reached the following conclusions:

- All of the proposals included a mix of housing types, with 8 out of 10 including at least three housing types;
- All of the proposals provided sufficient densities to support transit, with 5 to 10 units per acre in built-up areas. A distinction is made between overall density and the density of built-up areas because the projects included open space and other amenities, producing overall gross densities of 2 to 6 units per acre;
- The proposals provided adequate rights-of-way to operate transit, but even among these exemplars, 4 out of 10 had layouts that presented obstacles to the routing of transit; and
- The weakest element in the proposals was inadequate attention to operational considerations of transit, such as direct routing and minimization of turns.

Related Research: Beimborn, E., Rabinowitz, H., Gugliotta, P., Mrotek, C., and Yan, S. 1991. *Guidelines for Transit Sensitive Suburban Land Use Design*. Washington, D.C.: University Research and Training Program, U.S. Department of Transportation, DOT-T-91-13.