

## 2.4 Make Public Transit Easier to Use for Pedestrians and Bicyclists

### 2.4.1 Background: Make Public Transit Easier to Use for Pedestrians and Bicyclists

#### Definition

A recurring obstacle to public transit use is the so-called last/first mile problem, which refers to the ending or starting leg of a journey. Walking and bicycling can be a solution.

#### History

While successive federal transportation bills, starting with the Intermodal Surface Transportation Efficiency Act (ISTEA) of 1991, have increased funding for bicycle and pedestrian facilities, there has been little effort to coordinate pedestrian and bicycle facilities with transit spending.<sup>250</sup>

#### Current Status

There has been a significant increase in transit systems' efforts to carry more bicycles on their vehicles.<sup>251</sup>

#### Potential to Increase Active Transportation

Improving pedestrian and bicycle features on public transit vehicles and facilities surrounding transit stations and stops has a measurable effect on increasing the amount that people walk or bicycle to transit. Enhancing other aspects of the transit experience through route maps, smart fare cards, and other transit aids will also make transit a more attractive alternative for pedestrians and bicyclists.<sup>252,253</sup>

### Policies to Make Public Transit Easier to Use for Pedestrians and Bicyclists

**Policy 1:** Establish dedicated bicycle sections and bicycle carriers on transit vehicles

**Policy 2:** Increase pedestrian and bicyclist access to transit stops and stations

**Policy 3:** Provide route maps, arrival times, schedules, and integrated fare systems

**Policy 4:** Encourage transit-oriented development

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<sup>250</sup> Schneider, R. 2005. *TCRP Synthesis 62: Integration of Bicycles and Transit*. Transportation Research Board: Washington, D.C. Available at: [http://onlinepubs.trb.org/onlinepubs/tcrp/tcrp\\_syn\\_62.pdf](http://onlinepubs.trb.org/onlinepubs/tcrp/tcrp_syn_62.pdf) [accessed on June 19, 2011].

<sup>251</sup> American Public Transportation Association. 2009. *2009 Public Transportation Fact Book*. Available at: [http://www.apta.com/gap/policyresearch/Documents/APTA\\_2009\\_Fact\\_Book.pdf](http://www.apta.com/gap/policyresearch/Documents/APTA_2009_Fact_Book.pdf) [accessed May 19, 2011].

<sup>252</sup> Ewing, R. and R. Cervero. 2010. Travel and the built environment. *Journal of the American Planning Association*, 76 (3): 265-294.

<sup>253</sup> Pucher, J., J. Dill and S. Handy. 2010. Infrastructure, Programs, and Policies to Increase Bicycling: An International Review. *Preventive Medicine*, 50: S106-S125.

## 2.4.2 Impact of Policies: Make Public Transit Easier to Use for Pedestrians and Bicyclists

### Policy 1—Establish dedicated bicycle sections and bicycle carriers on transit vehicles

#### Definition

A bus bicycle carrier can hold two to three bicycles and can be used without assistance from the bus operator. On fixed- and light-rail transit systems entire cars or sections of a car can be designed to accommodate bicycles without interfering with other riders.

#### History

By 2008 70 percent of buses had bicycle racks.<sup>254</sup> On rail-based modes, most systems permit bicycles in cars, but with restrictions during peak periods. Folding bicycles are permitted on many trains and buses at all times.<sup>255</sup>

#### Effectiveness and Impact

Given that 53 percent of public transit trips in the U.S. are made by bus,<sup>256</sup> bus-bicycle integration has a significant potential impact. For rail transit, creating dedicated bicycle cars or areas for bicycles would extend the reach of bicycle travel considerably, given rail transit's generally greater speed.<sup>257</sup> Both efforts provide more transportation options.<sup>258,259</sup>

#### Economic Factors

There is limited data on the cost-benefit of investing in bicycle accommodations for rail transit.<sup>260</sup> For buses, accommodating bicycles with exterior racks is extremely cost-beneficial given that

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<sup>254</sup> American Public Transportation Association. 2009. *2009 Public Transportation Fact Book*. Available at: [http://www.apta.com/gap/policyresearch/Documents/APTA\\_2009\\_Fact\\_Book.pdf](http://www.apta.com/gap/policyresearch/Documents/APTA_2009_Fact_Book.pdf) [accessed May 19, 2011].

<sup>255</sup> Metropolitan Transportation Authority. *MTA Bike & Ride*. Available at: <http://www.mta.info/bike/> [accessed May 19, 2011].

<sup>256</sup> American Public Transportation Association. 2010. *2010 Public Transportation Fact Book*. Available at: [http://www.apta.com/resources/statistics/Documents/FactBook/APTA\\_2010\\_Fact\\_Book.pdf](http://www.apta.com/resources/statistics/Documents/FactBook/APTA_2010_Fact_Book.pdf) [accessed October 21, 2010].

<sup>257</sup> Martens, K. 2004. The Bicycle as a Feeding Mode: Experiences from Three European Countries. *Transportation Research Part D*, 9: 281-294.

<sup>258</sup> Pucher, J. and R. Buehler. 2009. Integrating Bicycling and Public Transport in North America. *Journal of Public Transportation*, 12 (3): 79-104.

<sup>259</sup> Hegger, R. 2007. Public Transport and Cycling: Living Apart or Together? *Public Transport International*, 2: 38-41.

<sup>260</sup> McClintock, H. and D. Morris. 2003. Integration of cycling & light rapid transit: Realising the potential. *World Transport Policy & Practice*, 9 (3): 9-14.

they are inexpensive, easy to operate, and do not take up capacity within the vehicles themselves.<sup>261</sup>

## Conclusion

Establishing dedicated bicycle areas and carriers on public transit vehicles helps make bicycling a more attractive option for a greater number of trips.<sup>262</sup>

## Policy 2—Increase bicyclist and pedestrian access to transit stops and stations

### Definition

Improvements to make transit more accessible to bicyclists and pedestrians include secure bicycle parking and storage<sup>263, 264</sup> and pedestrian-scale amenities such as wide walkways, protected crossings, and dedicated paths. Pedestrian improvements would result in calmer traffic movements directly adjacent to the station, increasing the safety of both bicyclists and drivers.<sup>265, 266</sup>

### History

While bicycle parking around transit has increased, little attention has been paid to secure or covered facilities that would allow transit users to store their bicycles while they were on their trip. For pedestrians, barriers exist because many U.S. transit stations, built with automobile users in mind, are surrounded by large parking lots, which can make access to the stations difficult for non-motorized users.<sup>267</sup>

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<sup>261</sup> Hagelin, C.A. 2005. *A Return on Investment Analysis of Bikes-on-Bus Programs*. National Center for Transit Research. Florida Department of Transportation: Tallahassee, Florida. NCTR 576-05. Available at: <http://www.nctr.usf.edu/pdf/576-05.pdf> [accessed on June 21, 2011]

<sup>262</sup> Pucher, J., J. Dill and S. Handy. 2010. Infrastructure, Programs, and Policies to Increase Bicycling: An International Review. *Preventive Medicine*, 50: S106-S125.

<sup>263</sup> Martens, K. 2004. The Bicycle as a Feeding Mode: Experiences from Three European Countries. *Transportation Research Part D*, 9: 281-294.

<sup>264</sup> Pucher, J., J. Dill and S. Handy. 2010. Infrastructure, Programs, and Policies to Increase Bicycling: An International Review. *Preventive Medicine*, 50: S106-S125.

<sup>265</sup> Pucher, J. and R. Buehler. 2009. Integrating Bicycling and Public Transport in North America. *Journal of Public Transportation*, 12 (3): 79-104.

<sup>266</sup> Nabors, D., R. Schneider, D. Leven, K. Lieberman and C. Mitchell. 2008. *Pedestrian Safety Guide for Transit Agencies*. U.S. Department of Transportation Federal Highway Administration. FHWA-SA-07-017.

<sup>267</sup> The Mineta Transportation Institute College of Business San José State University. 2002. *Envisioning Neighborhoods with Transit-Oriented Development Potential*. Available at: <http://transweb.sjsu.edu/publications/envisioning/Envisioning.htm> [accessed May 19, 2011].

## Effectiveness and Impact

If access to transit is easy, safe, and convenient, more people will use it.<sup>268</sup> Supporting bicyclists at transit stations encourages transit ridership.<sup>269-270-271</sup> Limited study has been devoted to the ridership effects of making transit stops and stations safer and more “walkable.”

## Economic Factors

The space needed to store one automobile can accommodate 10 to 12 bicycles, making bicycle parking a more efficient use of land per unit of transportation than automobile parking.<sup>272</sup> Similarly, pedestrian infrastructure improvements are much less costly and have much broader benefits in terms of space and infrastructure than those for motor vehicles.<sup>273</sup>

## Conclusion

Infrastructure improvements can increase bicyclist and pedestrian accessibility to transit and, in the case of bicyclists, increase the use of transit and the use of bicycles.<sup>274</sup>

## Policy 3—Provide route maps, arrival times, schedules, and integrated fare systems

### Definition

With the growth of smart phones and wider use of vehicle tracking devices, it is possible to deliver real-time information to transit patrons before they are on the system and while they are using it.<sup>275,276</sup> Smart card technology allows riders to pay fares for multiple agencies—bus, subway, light rail—with only one fare card, which makes using transit easier.<sup>277-278-279</sup>

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<sup>268</sup> Schneider, R. 2005. *TCRP Synthesis 62: Integration of Bicycles and Transit*. Transportation Research Board: Washington, D.C. Available at: [http://onlinepubs.trb.org/onlinepubs/tcrp/tcrp\\_syn\\_62.pdf](http://onlinepubs.trb.org/onlinepubs/tcrp/tcrp_syn_62.pdf) [accessed on June 19, 2011].

<sup>269</sup> Wardman, M., M. Tight and M. Page. 2007. Factors influencing the propensity to cycle to work. *Transportation Research Part A*, 41: 339-350.

<sup>270</sup> Netherlands Ministry of Transport. 2009. *Cycling in the Netherlands*. The Hague, Netherlands. Available at: <http://www.fietsberaad.nl/library/repository/bestanden/CyclingintheNetherlands2009.pdf> [accessed October 22, 2010].

<sup>271</sup> Martens, K. 2004. The bicycle as a feeding mode: Experiences from three European countries. *Transportation Research Part D*, 9: 281-294.

<sup>272</sup> Schneider, R. 2005. *TCRP Synthesis 62: Integration of Bicycles and Transit*. Transportation Research Board: Washington, D.C. Available at: [http://onlinepubs.trb.org/onlinepubs/tcrp/tcrp\\_syn\\_62.pdf](http://onlinepubs.trb.org/onlinepubs/tcrp/tcrp_syn_62.pdf) [accessed on June 19, 2011].

<sup>273</sup> Pucher, J. and L. Dijkstra. 2000. Making walking and cycling safer: Lessons from Europe. *Transportation Quarterly*, 54: 25-50.

<sup>274</sup> Schneider, R. 2005. *TCRP Synthesis 62: Integration of Bicycles and Transit*. Transportation Research Board: Washington, D.C. Available at: [http://onlinepubs.trb.org/onlinepubs/tcrp/tcrp\\_syn\\_62.pdf](http://onlinepubs.trb.org/onlinepubs/tcrp/tcrp_syn_62.pdf) [accessed on June 19, 2011].

<sup>275</sup> Eboli, L. and G. Mazzulla. 2009. A New Customer Satisfaction Index for Evaluating Transit Service Quality. *Journal of Public Transportation*, 12 (3): 21-37.

<sup>276</sup> Tyrinopoulos, Y. and C. Antoniou. 2008. Public Transit User Satisfaction: Variability and Policy Implications. *Transport Policy*, 15 (4): 260-272.

<sup>277</sup> Caulfield, B. and M. O'Mahony. 2009. A Stated Preference Analysis of Real-Time Public Transit Stop Information. *Journal of Public Transportation*, 12 (3): 1-20.

## History

Nearly every major transit provider offers online route mapping and schedules. Smart cards, standard in all new systems, are rapidly being adopted by older systems.<sup>280-281-282</sup>

## Effectiveness and Impact

Investing in transit service aids increases ridership.<sup>283-284-285</sup> Corresponding increases in physical activity should improve health.

## Economic Factors

Because there is such a wide variety of devices and systems, it is not possible to derive a definitive cost estimate. However, it is generally acknowledged that many of these innovations, such as real-time tracking of vehicles and integrated smart fare cards, create co-benefits in terms of the transit system's operations.<sup>286</sup>

## Conclusion

Transit aids, including route maps, schedules and fare, arrival and departure information, along with smart fare cards, can lead to increased public transit ridership. Transit systems in many cities have successfully implemented such services.

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<sup>278</sup> Iseki, H., A. Demisch, B.D. Taylor and A.C. Yoh. 2008. *Evaluating the Costs and Benefits of Transit Smart Cards*. California PATH research report, UCB-ITS-PRR-2008-14.

<sup>279</sup> Taylor, B.D., H. Iseki, M.A. Miller and M. Smart. 2009. *Thinking Outside the Bus: Understanding User Perceptions of Waiting and Transferring in Order to Increase Transit Use*. California PATH research report, UCB-ITS-PRR-2009-8.

<sup>280</sup> Smart Card Alliance. *About Smart Cards: Applications: Transportation*. Available at: <http://www.smartcardalliance.org/pages/smart-cards-applications-transportation> [accessed February 28, 2011].

<sup>281</sup> Iseki, H., A. Demisch, B.D. Taylor and A.C. Yoh. 2008. *Evaluating the Costs and Benefits of Transit Smart Cards*. California PATH research report, UCB-ITS-PRR-2008-14.

<sup>282</sup> American Public Transportation Association. 2009. *2009 Public Transportation Fact Book*. April 2009. Available at: [http://www.apta.com/gap/policyresearch/Documents/APTA\\_2009\\_Fact\\_Book.pdf](http://www.apta.com/gap/policyresearch/Documents/APTA_2009_Fact_Book.pdf) [accessed: November 1, 2010].

<sup>283</sup> Caulfield, B. and M. O'Mahony. 2009. A Stated Preference Analysis of Real-Time Public Transit Stop Information. *Journal of Public Transportation*, 12 (3): 1-20.

<sup>284</sup> Chau, P.Y.K. and S. Poon. 2003. Octopus: an E-Cash Payment System Success Story. *Communications of the Association for Computing Machinery*, 46 (9): 129-133.

<sup>285</sup> National Center for Transit Research at the Center for Urban Transportation Research, University of South Florida. 2005. *Enhancing the Rider Experience: The Impact of Real-Time Information on Transit Ridership*. Florida Department of Transportation. Available at: <http://www.nctr.usf.edu/projects/Year5/576-15.html> [accessed on June 21, 2011].

<sup>286</sup> Transportation Research Board. 2010. Transit 2010, Volume 1. Transportation Research Record: *Journal of the Transportation Research Board*. (2143).

## Policy 4—Encourage transit-oriented development

### Definition

Transit-oriented development (TOD, also known as transit-oriented design) is high-density mixed-use development within walking distance of transit stations.<sup>287,288,289</sup>

### History

Numerous municipalities and local governments have begun adopting land use policies that support TOD, but deployment has not been uniform or predictable.<sup>290</sup>

### Effectiveness and Impact

TOD greatly reduces the need for driving.<sup>291</sup> Successful TODs reinforce both the community and the transit system and involve numerous components including: optimal transit system design; community partnerships; understanding local real estate markets; planning for TOD; coordination among local, regional, and state organizations; and providing the right mix of planning and financial incentives and resources.<sup>292,293</sup>

When coupled with measures to create a multi-modal transportation system, measures to facilitate TOD have often resulted in significantly high rates of transit use. More research, however, is needed to determine the degree to which residents of transit-oriented developments are “self-selecting,” that is, already biased toward transit use before moving to the development.<sup>294,295</sup>

### Economic Factors

Local governments’ cooperation is essential in promoting TOD through plans, policies, zoning provisions, and incentives for supportive densities and designs. Development must be more than

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<sup>287</sup> Cervero, R., C. Ferrell and S. Murphy. 2002. *Transit-Oriented Development and Joint Development in the United States: a literature review*. TCRP Report Number 52. Transportation Research Board. National Academies of Science. Washington, DC.

<sup>288</sup> California Department of Transportation. 2002. *Statewide Transit-Oriented Development Study: Factors for Success in California*.

<sup>289</sup> TransitOrientedDevelopment.org. *Components of Transit Oriented Design*. Available at: <http://www.transitorienteddevelopment.org/tod.html> [accessed March 3, 2011].

<sup>290</sup> Ibid.

<sup>291</sup> California Department of Transportation. 2002. *Statewide Transit-Oriented Development Study: Factors for Success in California*.

<sup>292</sup> Ibid.

<sup>293</sup> TransitOrientedDevelopment.org. *Components of Transit Oriented Design*. Available at: <http://www.transitorienteddevelopment.org/tod.html> [accessed March 3, 2011].

<sup>294</sup> Ewing, R. and R. Cervero. Travel and the Built Environment. *Journal of the American Planning Association* 6 (3): 265-294.

<sup>295</sup> Cao, X., P. Mokhtarian and S. Handy. 2008. *Examining the Impacts of Residential Self-Selection on Travel Behavior: Methodologies and Empirical Findings*. Institute of Transportation Studies, UC Davis.

just adjacent to transit; it must be shaped by transit regarding parking, density, and/or building orientation to be considered transit-oriented.<sup>296</sup>

Altering land use regulations to support TOD requires that resources be devoted to updating comprehensive and economic development plans, as well as zoning, building, and subdivision codes. This primarily takes the form of planners' salaries and the costs related to public participation. TOD has the potential, if executed in tandem with multiple transit options, of adding substantially to government revenues in the form of sales and property taxes generated by the increased commercial and retail activity and land values.<sup>297</sup> The cost of supplying municipal services to TOD areas might appear to be higher, but could ultimately be lower if such development is constructed instead of lower-density development in undeveloped areas. While support for TOD is growing, many developers still consider these projects to be high risk.<sup>298</sup>

## Conclusion

TOD can attract significant numbers of motorists to transit in areas that are experiencing rapid growth and rising traffic congestion and have an extensive transit network in place.<sup>299</sup>

### 2.4.3 Conclusions: Make Public Transit Easier to Use for Pedestrians and Bicyclists

Public transit is a natural partner to walking and bicycling, and by making transit easier for pedestrians and bicyclists to use, walking and bicycling's attractiveness as transportation alternatives increases. Transit authorities can make their vehicles and stops and stations more accessible to pedestrians and bicyclists by adding racks and bicycle parking and by improving walkways, entrances, and platforms. Transit aids, such as maps, route-finding applications, smart fare cards, and real-time arrival information can also enhance the attractiveness of transit and increase pedestrians' and bicyclists' transit use. The link between transit and pedestrians and bicyclists can also be strengthened by encouraging TOD—mixed-use, compact development near transit stops and stations—increasing the convenience of access to the transit system for those who walk and bicycle.

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<sup>296</sup> California Department of Transportation. 2002. *Statewide Transit-Oriented Development Study: Factors for Success in California*.

<sup>297</sup> Cervero, R., S. Murphy, C. Ferrell, N. Goguts, Y.H. Tsai, et al. 2004. *Transit-Oriented Development in the United States: Experiences, Challenges, and Prospects*. TCRP Report 102. Transportation Research Board. National Academies of Science. Washington, D.C.

<sup>298</sup> Livable Places. *Encouraging Transit Villages*. Available at: <http://www.livableplaces.org/policy/todincentives.html> [accessed March 3, 2011].

<sup>299</sup> Cervero, R. 2004. *Transit Oriented Development in America: Contemporary Practices, Impacts, and Policy Directions*. International Planning Symposium on Incentives, Regulations, and Plans –The Role of States and Nation-States in Smart Growth Planning. National Center for Smart Growth Research and Education, University of Maryland Habiforum Foundation, The Netherlands September 30-October 1, 2004.