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Week 6 Policy Brief (#7)

What is the Likely Impact of Investments in Bicycle and Pedestrian Facilities?

INTRODUCTION

This policy brief examines bicycle and pedestrian facilities. These facilities have received new priority in recent years, as concerns over traffic congestion, energy and environmental quality have forced a redirection of policy towards historically underutilized modes.

Determining the likely impacts of these facility investments, and more specifically whether they are justified, will be the basis of this brief. Most importantly, policies toward increasing investments in bicycle and pedestrian facilities will be critically analyzed according to the “4 Es” of transportation, namely efficiency, equity, environment, and experience. This study will be divided into two primary components: 1) an overview of policy initiatives and 2) an evaluation of these initiatives. The evaluation will include a review of recent studies that have sought to determine their impact, as well an examination of the initiatives against the “4E” criteria.

PART I (overview)

By definition, investments in bicycle and pedestrian facilities are intended to increase the use of these modes by making them an attractive alternative for work as well as non-work travel. Presumably, this policy produces benefits in that these modes are less energy-intensive (at least from the perspective of fossil fuel use) and therefore enhance environmental quality. An Oregon Department of Transportation plan for bicycle and pedestrian facilities goes further in outlining the benefits of biking and walking as such (Oregon DOT, 1995):

- Reduce traffic congestion
- Reduce air and noise pollution
- Reduce wear and tear on our roads
- Reduce consumption of petroleum
- Reduce crashes and property damage
- Reduce the need for additional roads, travel lanes and parking
- Improve Oregonians' health and well-being through regular exercise

Clearly, there are many potential benefits to bicycling and walking, each with varying degrees of success and importance as policy goals.

Support for bicycle and pedestrian investments has increased significantly through passage of the past two federal surface transportation bills, namely the Intermodal Surface Transportation Efficiency Act (ISTEA) and the Transportation Equity Act for the 21st Century (TEA-21). These pieces of legislation have benefited pedestrians and bicyclists by providing an increased federal presence in supporting funding and planning for new or upgraded facilities. In addition to increases in funding for bicycle and pedestrian facilities (available from National Highway System appropriations and Transportation Enhancement funds), states and local units of government are given greater flexibility in how they spend their surface transportation funds (FHWA 1998). There are also federal requirements for states and local Metropolitan Planning Organizations (MPOs) to include provisions for bicyclists in state and metropolitan-level transportation plans. As a result, states and MPOs spent \$339.1 million on stand-alone bicycle and pedestrian projects in 2001, up from just \$17.1 million in 1991 (FHWA 2002, cited in Dill and Carr, 2003).

Most bicycle and pedestrian programs are administered by cities and counties, with funds channeled through MPOs, since many facilities are included as a component of metropolitan transportation plans. As noted above, most plans contain large amounts of federal funding for

facilities. Cities can have an impact on pedestrian and bicycling activities. Most large cities have policies aimed at non-motorized modes, especially since this is where the highest shares of bicycling and pedestrian trips occur. Cities such as Portland and Seattle go to great lengths to include pedestrian and bicycling components in their transportation plans. Minneapolis, which has the nation's highest share of commute trips by bicycle, provides information on city bicycle plans, facilities within the city, location of bike lockers downtown, and bicycle accommodations on a local transit route through its website (City of Minneapolis, 2002).

At the regional level, the Metropolitan Council of the Twin Cities maintains a network of 136 miles of off-road, regional shared bicycle and pedestrian trails. These trails are connected to the regional park system, and are not necessarily emphasized as commuter facilities, though they can be used for that purpose. The Council places more emphasis on helping cities plan for bicycle and pedestrian facilities in order to integrate them with the regional transportation system, including the Council's transit operations. More recently, the Council has made plans to include bicycle and pedestrian travel in its decennial Travel Behavior Inventory. Previously, non-motorized trips were not counted as part of the inventory (Metropolitan Council, 2001).

Part II (evaluation)

In evaluating policies designed to improve pedestrian and bicycling facilities, it will be necessary to examine some studies that have been done fairly recently, as well as note the availability of data or lack thereof to further study the subject.

Many studies of non-motorized behavior, particularly pedestrian behavior, have emanated from planning and architectural fields. This is not surprising, given the natural fascination with pedestrian activity and urban form. In a more exploratory piece, Owens (1993) notes some aspects of urban form that should be given more consideration when analyzing the impact of neighborhood form and provision of pedestrian

facilities. He emphasizes physical patterns, neighborhood structure, and certain “perceptive qualities” as subtle, qualitative aspects that in concert can impact pedestrian activity. Density and land use, typical planning variables, are considered to be not well enough understood because of spatial and socio-economic complexities and the neighborhood level. Owens also noted a taxonomy in the literature on pedestrian activity, consisting of studies related to mode choice/trip making, automobile effects on neighborhood pedestrian activity, and street life.

A more thorough study of the impact of neighborhood form and pedestrian activity was conducted by Hess et al (1997). In this study, more attention is given to the amount and quality of the facilities provided. Hess et al grouped a number of Seattle neighborhoods into types of “urban” and “suburban”, based on similar land use, density, and urban form variables. In each, a number of measures were used to analyze the quality of the pedestrian network. Empirical observations of pedestrian volumes were then taken to compare by neighborhood type. Urban pedestrian volumes three times higher were observed in the “urban” neighborhoods. Some of the factors cited in this case were pedestrian network connectivity, direct pedestrian paths to destinations, as measured by variables such as a walking distance contour and an “effective residential density”, centered around popular destinations. Another factor was network continuity, measured by the ratio of sidewalk systems to the length of street frontage.

A follow-up study by Hess et al completed in 1999 confirmed the inadequacy of pedestrian facilities in most suburban-type neighborhoods, noting the indirect routes and discontinuities that existed. Further, they concluded that medium-density clusters, including multi-family housing, mixed-use developments, or schools should be incorporated into planning programs for pedestrian infrastructure investment. Commercial clusters were also seen as a priority to be connected to nearby neighborhoods via pedestrian paths, especially along arterial streets.

Research on bicycle facility use, though containing scant empirical evidence, lends itself more easily to empirical study. Many studies have sought to determine the variables responsible for levels of bicycle commuting. One study by Baltes (1996) indicated that variables such as race, poverty, and vehicle availability are significant in explaining some of the variation in commuting behavior. Nelson and Allen (1997) conducted a study of 18 cities using days of rainfall, temperature, terrain, miles of bikeways, and percentage of college students in the population as variables. Bikeway mileage, days of rainfall, and percentage of college students were significant variables. They concluded that an additional mile of bikeway per 100,000 people is associated with a .069 percent increase in bicycle commuting.

One of the most thorough studies to date was conducted recently by Dill and Carr (2003). This study, building on the work of Nelson and Allen, used Census 2000 Supplemental Survey (C2SS) data from 35 U.S. cities and eight variables, including many of Nelson and Allen variables along with average gas price, household income, and average spending per capita on pedestrian and bicycle facilities. Furthermore, they broke down the facilities into two classes, based on designation as a bike path or on-street bike lane. Their findings, much like those of Nelson and Allen, were that higher levels of bicycle infrastructure are positively and significantly correlated with higher rates of bicycle commuting.

The overall size of bicycle commuting rates are rather low, though. The Dill and Carr study indicates that Minneapolis, with the highest overall bicycle commute mode split, still garners less than 3 percent of all commute trips. Pucher et al (1999) indicate that even though the number of trips taken by bicycle has doubled between 1977 and 1995, the overall mode split for bicycling is only about 0.9 percent. They also speculate that the provision of bicycle facilities could be a response to the level of cycling in an area, rather than a cause.

To date, empirical data on bicycle and pedestrian facility use have been limited, due to lack of data. More recently, new sources of data have been encountered, making more studies feasible. In addition to traditional census journey-to-work data, other sources are being recognized such as Dill and Carr's recent work with the C2SS sample. Transportation surveys, such as the NPTS, the NBWS, and the Twin Cities' own Travel Behavior Inventory may shed more light on the nature of pedestrian and bicycle use, particularly for non-work purposes.

CONCLUSION

Some concluding remarks can be made about the effectiveness of pedestrian and bicycle investments with relation to the "4 Es" of transportation planning. Each aspect can be rated on a simple scale of 1 to 4 (1 being "high" and 4 being "low").

With respect to efficiency, I would give bicycle and pedestrian facility investments a 3. While it is certainly true that both of the non-motorized modes are inherently efficient with respect to energy consumption, their efficiency in economic terms has not been clearly proven. Despite dramatic increases in spending on bicycle and pedestrian facilities during the 1990s, mode splits for neither of the two have materially increased. Oregon DOT's plan for bicycling indicates a goal of doubling the number of pedestrian and walking trips over 20 years. They also indicated a need for around \$200 million to complete the projects they had identified consistent with this goal.

On equity grounds, bicycle and pedestrian investments deserve a 2. While they do not materially enhance regional accessibility, they do provide a reasonable alternative for shorter distance trips. For people who cannot afford a car, a bicycle may be a useful, low-cost option to complement transit service. Studies of pedestrian activity (Hess et al) and bicycle use (Baltes) both indicate prevalent use among lower-income individuals.

Environmental issues, supposedly a strong suit for bicycle and pedestrian activities, are given a 3. Many of the potential environmental benefits of non-motorized modes were outlined earlier in this study. However, for benefits such as air pollution and congestion reduction to be achieved, non-motorized modes must comprise a significant share of trips. There does not seem to be evidence of this. Furthermore, studies such as Dill and Carr's suggest that increases in facility investments may lead to only marginal increases in use. There do seem to be markets for these facilities, particularly in dense urban neighborhoods and congested downtown districts, however they do not seem to factor heavily into regional transportation investment priorities.

The final criterion, user experience, is the most favorable for bicycle and pedestrian facility investments. Both non-motorized modes are used extensively for recreational purposes and often provide the user with a pleasant experience. Beyond this are the health benefits that accrue to pedestrians and cyclists, which are commonly claimed as worthy goals in themselves.

Overall, evaluating pedestrian and bicycle facility investments on the 4E criteria, I would give this policy a score between 2 and 3. Its efficiency is questionable, while it appears to be reasonably equitable mode. While its environmental impact may be somewhat limited, it does provide a number of private benefits in terms of user experience. There certainly are markets for bicycle and pedestrian investments, such as dense downtown zones and college campuses, but as a policy tool and a priority for regional transportation funding, bicycle and pedestrian facilities will likely play a secondary role.

REFERENCES

Baltes, M.R. 1996. Factors Influencing Nondiscretionary Work Trips by Bicycle Determined from 1990 Census Metropolitan Statistical Area Data. *Transportation Research Record*, 1538: 96-101.

City of Minneapolis. 2002. Bicycling in Minneapolis (<http://www.ci.minneapolis.mn.us/citywork/public-works/transportation/bicycles>) 2/18/03.

Dill, Jennifer and Theresa Carr. 2003. Bicycle Commuting in Major U.S. Cities: If You Build Them, Commuters Will Use Them—Another Look. Paper presented at the 2003 Transportation Research Board Annual Meeting.

Federal Highway Administration. 1998. Transportation Equity Act for the 21st Century, A Summary, *Protecting Our Environment* (<http://www.fhwa.dot.gov/tea21/sumtoc.htm>). 2/17/03.

_____. 2002. Summary of Federal Highway Administration (FHWA) Pedestrian and Bicyclist Activities Prepared for 2002 Transportation Research Board Meeting. (<http://www.fhwa.dot.gov/environment/bikeped/bp-guid.htm>). 11/1/02.

Hess, Paul M., Anne Vernez Moudon, Mary Catherine Snyder, and Kiril Stanilov. 1997. Effects of Site Design on Pedestrian Travel in Mixed-Use, Medium-Density Environments. *Transportation Research Record* 1578: 48-55.

_____. 1999. Site Design and Pedestrian Travel. *Transportation Research Record* 1674: 9-19.

Metropolitan Council. 2001. Transportation Policy Plan. Chapter 2: Existing Transportation Systems and Issues. (<http://www.metrocouncil.org/planning/transportation/TPP/TPPChapter2.pdf>). 2/18/03.

Nelson, A.C. and D. Allen. 1997. If You Build Them, Commuters Will Use Them. *Transportation Research Record* 1578: 79-83.

Oregon Department of Transportation. 1995. Oregon Bicycle and Pedestrian Plan.

Owens, Peter. 1993. Neighborhood Form and Pedestrian Life: Taking a Closer Look. *Landscape and Urban Planning* 26: 115-135.

Pucher, J., C. Komanoff and P. Schimek. 1999. Bicycling Renaissance in North America? Recent Trends and Alternative Policies to Promote Bicycling. *Transportation Research, Part A* 33: 625-654.