

## ARTICLES

### The Machine, the Garden, and the City: Toward an Access-Efficient Transportation Planning System

by Keith Bartholomew

*Editors' Summary: The recent reauthorization of the Safe, Accountable, Flexible, Efficient Transportation Equity Act, the nation's primary transportation and funding planning statute, has caused some to question whether the Act fosters greater integration of transportation and community development. In this Article, Keith Bartholomew explores this issue. He begins with an explanation of the purpose of cities and how they necessitated transportation systems. He then discusses the history and principles of transportation planning policy. Finally, he offers a critique and recommendations for increasing the efficacy of the Act, emphasizing the importance of shifting focus from mobility to accessibility.*

"[The city] comes to be for the sake of living, but it remains in existence for the sake of living well."<sup>1</sup>

Transportation systems provide the armature around which neighborhoods, towns, and regions are constructed,<sup>2</sup> and the nature of those systems significantly influences the quality of the surrounding communities.<sup>3</sup> Conversely, the characteristics of a community can significantly influence the functioning of the transportation systems that serve that community.<sup>4</sup> Now that the U.S. Congress has reauthorized the nation's primary transportation funding and planning statute<sup>5</sup> and the U.S. Department of Transportation (DOT) has issued regulations to implement the Act's planning provisions,<sup>6</sup> it is a good time to ponder both the role that transportation plays in the life of communities and the community influences that affect the functioning of transportation systems, and to ask whether the new en-

actment fosters greater integration of community and transportation development, and if not, what other models might be available.

In looking at the interactions between transportation and community, it is important first to note that aside from Sunday afternoon drives in the country and Saturday night cruises down Main Street, transportation is a derived demand.<sup>7</sup> That is, its value is in the role it plays in facilitating the functions of daily life, not in the actual activity of moving. For the most part, people value transportation not because they want to move around, but because they need it to go to work, school, shopping, entertainment, etc.

That being so, it would seem that an obvious question for transportation planning participants would be: How can all the activities that go into making a full and meaningful life be accomplished without excessive travel? Given the enormous level of environmental<sup>8</sup> and fiscal<sup>9</sup> resources needed

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1. ARISTOTLE, *POLITICS* 3 (C.D.C. Reeve trans., Hackett Publishing 1998).
2. PETER CALTHORPE & WILLIAM FULTON, *THE REGIONAL CITY* 58 (Island Press 2001).
3. See DANIEL CARLSON ET AL., *AT ROAD'S END: TRANSPORTATION AND LAND USE CHOICES FOR COMMUNITIES* 3 (Island Press 1995).
4. See, e.g., ANTHONY DOWNS, *STILL STUCK IN TRAFFIC* 151 (Brookings Institution 2004); BORIS S. PUSHKAREV & JEFFREY M. ZUPAN, *PUBLIC TRANSPORTATION AND LAND USE POLICY* (Indiana Univ. Press 1977).
5. Safe, Accountable, Flexible, Efficient Transportation Equity Act: A Legacy for Users, Pub. L. No. 109-59, 119 Stat. 1144 (2005).
6. Statewide Transportation Planning; Metropolitan Transportation Planning, 72 Fed. Reg. 7224 (Feb. 14, 2007) (to be codified at 23 C.F.R. pt. 450).

7. Susan Hanson, *The Context of Urban Travel*, in *THE GEOGRAPHY OF URBAN TRANSPORTATION* 3, 3-4 (Susan Hanson & Genevieve Giuliano eds., 3d ed., Guilford Press 2004). The DOT estimates that only .5% of all trips are made for the pleasure of driving only. 1 U.S. DOT, 1990 NPTS DATABOOK 4-72 (U.S. Gov't Printing Office 1994). *But cf.* Patricia L. Mokhtarian et al., *Understanding the Demand for Travel: It's Not Purely "Derived,"* 14 *INNOVATION* 355, 377 (2001) ("[W]e should begin to view travel not just as a disutility, but as a literal 'good' having both positive and negative characteristics.")

8. There are many sources that catalog environmental resources implicated in transportation systems. For a general summary of the issue, see F. KAID BENFIELD ET AL., *ONCE THERE WERE GREENFIELDS: HOW URBAN SPRAWL IS UNDERMINING AMERICA'S ENVIRONMENT, ECONOMY, AND SOCIAL FABRIC* (Natural Resources Defense Council 1999).

9. Annual expenditures on U.S. highway construction, maintenance, and administration have been in excess of \$100 billion since 1998; in 2003, expenditures were estimated at more than \$143 billion. U.S. CENSUS BUREAU, *STATISTICAL ABSTRACT OF THE UNITED STATES: 2006*, at 709 (U.S. Gov't Printing Office 2006). Capital and operat-

to build, maintain, and operate community and regional transportation systems, it would seem logical that a primary role for transportation planning would be to facilitate daily household activity needs while minimizing the need to increase transportation costs on the individual and society. Yet, despite occasional hortatory language in our federal transportation legislation,<sup>10</sup> this calculus hardly ever appears in transportation planning documents or processes.<sup>11</sup> Rather, the predominant concerns appear to be how to reduce vehicle congestion during peak periods and how to increase vehicle travel flow at identified traffic bottlenecks.<sup>12</sup>

If transportation systems and the communities that are both served and affected by those systems are to be fully integrated in a planning process, the focus of planning practice needs to shift from mobility to accessibility. Mobility, which has been the primary focus of U.S. transportation planning for the past half century, focuses on the movement of vehicles in time and space.<sup>13</sup> Accessibility, on the other hand, focuses on the ease and convenience with which a person (or an increment of freight) can gain access to a needed activity.<sup>14</sup> While the two concepts are related, they are not mutually dependent. In many circumstances increased mobility can increase a person's level of accessibility to daily destinations.<sup>15</sup> Assuming a constant geographic arrangement of destinations, the number of places one can access in a car is frequently much greater than the number accessible by walking.<sup>16</sup> Accessibility, however, is not dependent on mobility. For example, a person's access to grocery shopping can be increased by the construction of a new store within walking distance of that person's home or place of work. This would result in a net increase in the person's accessibil-

ing expenditures for U.S. transit systems have totaled more than \$35 billion annually since 1995; in 2003, the total was more than \$53 billion. *Id.* at 722.

10. See, e.g., Intermodal Surface Transportation Efficiency Act of 1991, 102 Pub. L. No. 240, §2, 105 Stat. 1914, 1914 (1991) ("The National Intermodal Transportation System shall consist of all forms of transportation in a unified, interconnected manner . . . to reduce energy consumption and air pollution while promoting economic development and supporting the Nation's preeminent position in international commerce.").
11. See Benjamin K. Olson, *The Transportation Equity Act for the 21st Century: The Failure of Metropolitan Planning Organizations to Reform Federal Transportation Policy in Metropolitan Areas*, 28 *TRANSP. L.J.* 147, 170 (2000) ("[S]tates continue to subvert the intent of federal transportation policy reform by directing federal transportation dollars towards road-building projects that encourage 'sprawl' development in relatively unpopulated spaces within the metropolitan area and increase automobile traffic and environmental pollution.").
12. *Id.* As an illustrative example, consider the environmental impact statement process for a proposed expansion of Interstate 15 through a portion of northern Utah. After initial consideration of 22 capacity expansion and systems improvement alternatives, only those alternatives including the anticipated full expansion of the highway (in addition to the "no-action" alternative) were carried forward for full analysis. The other alternatives were dropped because "they did not improve roadway congestion on I-15." Utah DOT, *I-15 Corridor Utah County-Salt Lake County, Alternatives Development and Screening*, [http://www.udot.utah.gov/i15utahcounty/downloads/alt\\_screening\\_info.pdf](http://www.udot.utah.gov/i15utahcounty/downloads/alt_screening_info.pdf).
13. See Hanson, *supra* note 7, at 4.
14. *Id.*
15. Victoria Transport Policy Institute, *Accessibility*, in *TDM ENCYCLOPEDIA* (2005), available at <http://www.vtpi.org/tdm/tdm84.htm>.
16. *Id.* This is not always the case, however. Consider the central portions of many of the world's large cities (mid-town Manhattan, for example) where driving a car can actually provide for less accessibility than walking.

ity in a way that is independent of mobility. In fact, the person's expressed amount of mobility would likely decrease.

Striving for ever-increasing levels of mobility can, in fact, result in reduced accessibility. Increasing mobility by increasing transportation system capacity has facilitated a steadily expanding development pattern.<sup>17</sup> The saturation of automobile-related infrastructure and corresponding automobile dependency within dominant segments of American society have helped lead to a dispersion of destinations, thereby increasing the distances between where people are and where they need to go. In a self-fulfilling way, this has made access to many destinations increasingly dependent on high levels of mobility, frequently achievable only by automobile.<sup>18</sup> These mobility levels, however, are not shared across society<sup>19</sup> and they are increasingly difficult to maintain fiscally and environmentally.<sup>20</sup> Even within the car owning and driving portions of society, destinations within a constantly dispersing development pattern are becoming less accessible because of increased distances<sup>21</sup> and higher levels of automobile congestion.<sup>22</sup> Instead of obsessing on the need to ease or increase the flow of vehicles, transportation planning must focus on facilitating accessibility to needed and desired activities. In other words, the object of transportation planning needs to shift from looking at the needs of the machine to the needs of the operator.

17. PETER NEWMAN & JEFFREY KENWORTHY, *SUSTAINABILITY AND CITIES: OVERCOMING AUTOMOBILE DEPENDENCE* 31-32 (Island Press 1999).

18. Hanson, *supra* note 7, at 4.

19. According to the U.S. Census Bureau, in 2000 more than 60.2 million Americans (21.4% of the population) were too young to drive (age 15 or younger); more than 25.4 million (9%) were 70 or older and may have limited or reduced ability to drive; more than 21.1 million (7.5%) reported a physical disability, which may impair driving abilities; and nearly 33.9 million (12.3%) had income below the poverty level, making the ownership and operation of an automobile financially prohibitive. U.S. Census Bureau, *Census 2000 Summary File 1 and Summary File 3*, <http://factfinder.census.gov>. See generally SURFACE TRANSPORTATION POLICY PROJECT, *DRIVEN TO SPEND: PUMPING DOLLARS OUT OF OUR HOUSEHOLDS AND COMMUNITIES* (2005); Michael Cameron, *Transportation Efficiency and Equity in Southern California: Are They Compatible?*, in JUST TRANSPORTATION: DISMANTLING RACE AND CLASS BARRIERS TO MOBILITY 53, 59 (Robert D. Bullard & Glenn S. Johnson eds., New Society Publishers 1997) ("[T]he 20 percent of the population in the lowest-income group receives 6 percent of the total regional transportation benefits . . ."); AMERICAN ASSOCIATION OF RETIRED PERSONS (AARP), *BEYOND 50.03: A REPORT TO THE NATION ON INDEPENDENT LIVING AND DISABILITY* 87 (2003), available at [http://assets.aarp.org/rgcenter/il/beyond\\_50\\_il.pdf](http://assets.aarp.org/rgcenter/il/beyond_50_il.pdf). The AARP reports: "[A]s people move from their 70s into their 80s, the proportion of licensed drivers drops from more than 90 percent to just over 50 percent."

20. A 1998 estimate of the additional highway capacity needed to maintain congestion in the 70 most congested urban areas in the U.S. at current levels concluded that it would require the construction of nearly 5,000 lane miles annually, at the cost of \$24 billion per year. Surface Transportation Policy Project, *An Analysis of the Relationship Between Highway Expansion and Congestion in Metropolitan Areas: Lessons From the 15-Year Texas Transportation Institute Study*, <http://www.ucolick.org/%7Ede/AltTrans/analysis.html>.

21. Panos D. Prevedouros & Joseph L. Schofer, *Trip Characteristics and Travel Patterns of Suburban Residents*, 1328 *TRANSP. RES. REC.* 49, 49 (1991) (indicating that residents of outer-ring suburbs spend 25% more time in traffic despite higher speeds).

22. See DAVID SHRANK & TIM LOMAX, *THE 2005 URBAN MOBILITY REPORT 2* (Texas Transportation Inst. 2005), available at <http://mobility.tamu.edu/ums/report/>. The report states: "Measures in all of the population size categories show more severe congestion that lasts a longer period of time and affects more of the transportation network in 2003 than in 1982."

This Article explores some of the fundamental principles of how this shift might occur. Set within an historical assessment of federal transportation planning law, the Article outlines four primary policy factors that must be engaged if communities and regions are to move away from a mobility-based transportation planning system toward one focused on accessibility. The Article continues with an investigation of integrated land use transportation scenario planning, a technique that has been gaining popularity in U.S. metropolitan areas since the late 1980s and could effectively provide the shift to accessibility-based transportation planning. To begin, however, one must first understand a bit about why cities exist.

## I. The Purpose of Cities

The fundamental idea behind cities is permanence: permanent shelter, permanent storage, permanent places of commerce.<sup>23</sup> The emergence of cities is, hence, tied to societal shifts from nomadic hunting/gathering to cultivated agriculture.<sup>24</sup> Once groups of humans began putting down botanical roots, they began putting down social roots as well.<sup>25</sup>

At first, becoming rooted in one location allowed only small expansions in the basic social unit: from the family to the clan.<sup>26</sup> Going from the clan settlement to a real “city,” however, required two further advances: an agricultural surplus and some form of writing.<sup>27</sup> With these developments, a nonagricultural class of labor could be created, and settlements could go beyond being just a collection of farmers and begin to achieve the kinds of complexity associated with urban development.<sup>28</sup> This change required technological advances that could facilitate the production of surplus food. The advances came together, at least in the Tigris/Euphrates portion of the Fertile Crescent, during the Bronze Age:

As far as the present record stands, grain cultivation, the plow, the potter’s wheel, the sailboat, the draw loom, copper metallurgy, abstract mathematics, exact astronomical observation, the calendar, writing and other modes of intelligible discourse in permanent form, all came into existence at roughly the same time, around 3000 B.C. give or take a few centuries.<sup>29</sup>

The technical innovations, and the food surpluses they facilitated, gave rise to whole categories of livelihoods that were only indirectly related to agriculture. These occupations, in turn, spawned still others; complexity was, in a sense, breeding itself.<sup>30</sup>

By the time of the creation of Greek and Roman cities, the concept of urban settlement included, almost universally, the functions of marketplace, government administration, judicial adjudication, entertainment, social gathering, industry, and religious observance.<sup>31</sup> Many had notice boards for the posting of proclamations and other pieces of public information; pubs or drinking houses, which facilitated prostitution as well as social exchange; sports arenas; harbors and shipyards; and bathhouses, which were also a place of social gathering in addition to providing for personal hygiene.<sup>32</sup> It is little wonder, then, that the Greek word *polis* has been interpreted to have at least seven distinct meanings in modern English, including stronghold, city, territory, social community, body of government, and political community.<sup>33</sup>

Over the centuries, cities became the central locations for culture, commerce, religion, education, and politics. These were the places of the concert hall, the temple, the market, the academy, and the castle. In cities, people sought profit, solace, security, knowledge, entertainment, power, and, somewhat ironically, solitude. Referring specifically to New York City, E.B. White observed that the city “is the concentrate of art and commerce and sport and religion and entertainment and finance, bringing to a single compact arena the gladiator, the evangelist, the promoter, the actor, the trader and the merchant.”<sup>34</sup>

In a word, people come to cities seeking exchange. Not just the exchange of the market—though that is of central importance—but also exchanges of ideas, cultures, values, and (not infrequently) deoxyribonucleic acid (DNA). Quoting Lewis Mumford: “Through its concrete, visible command over space the city lends itself, not only to the practical office of production, but to the daily communion of its citizens.”<sup>35</sup> The city, in fact, “function[s] as the specialized organ of social transmission.”<sup>36</sup>

Virtually all of the institutions that are central to our current society have their roots in the exchanges that are facilitated by the proximity of humans to each other found in cities and towns.<sup>37</sup> Indeed, cities have become synonymous with civilization and culture,<sup>38</sup> and even with life itself:

Until lately the best thing that I was able to think of in favor of civilization, apart from blind acceptance of the order of the universe, was that it made possible the artist, the poet, the philosopher, and the man of science. But I think that is not the greatest thing. Now I believe that the greatest thing is a matter that comes directly home to us all. When it is said that we are too much occupied with the means of living to live, I answer that the chief worth of civilization is just that it makes the means of living more complex; that it calls for great and combined intel-

23. LEWIS MUMFORD, *THE CULTURE OF CITIES* 3 (Harcourt, Brace & Co. 1938).

24. A.E.J. MORRIS, *HISTORY OF URBAN FORM: BEFORE THE INDUSTRIAL REVOLUTION* 21 (Prentice Hall 3d ed. 1996).

25. *Id.* But see JANE JACOBS, *THE ECONOMY OF CITIES* 3-48 (Vintage Books 1969) (“[W]ork that we usually consider rural has originated not in the countryside, but in cities.”).

26. MORRIS, *supra* note 24, at 4.

27. *Id.* at 5.

28. *Id.*; Gideon Sjoberg, *The Origin and Evolution of Cities*, *SCI. AM.*, Sept. 1965, at 54, 57.

29. LEWIS MUMFORD, *THE CITY IN HISTORY: ITS ORIGINS, ITS TRANSFORMATIONS, AND ITS PROSPECTS* 33 (Harcourt, Brace & World 1961).

30. MUMFORD, *supra* note 23, at 6.

31. DANIEL SPERBER, *THE CITY IN ROMAN PALESTINE* 73 (Oxford Univ. Press 1998).

32. *Id.* at 15-18, 49, 58, 73, 77.

33. MOGENS HERMAN HANSEN, *POLIS AND CITY-STATE: AN ANCIENT CONCEPT AND ITS MODERN EQUIVALENT* 52 (Munksgaard 1998).

34. See E.B. WHITE, *HERE IS NEW YORK* 19 (Little Bookroom 1999) (1949).

35. MUMFORD, *supra* note 23, at 5.

36. VICTOR BRANFORD & PATRICK GEDDES, *THE COMING POLITY* 156 (revised ed., C.N. Caspar 1919).

37. See ROBERT N. BELLAH ET AL., *THE GOOD SOCIETY* 5 (Vintage Books 1992).

38. See generally PETER HALL, *CITIES IN CIVILIZATION* (Fromm International 2001) (1998).

lectual efforts, instead of simple, uncoordinated ones, in order that the crowd may be fed and clothed and housed and moved from place to place. Because more complex and intense intellectual efforts mean a fuller and richer life. They mean more life. Life is an end in itself, and the only question as to whether it is worth living is whether you have enough of it.<sup>39</sup>

What is it about cities that facilitates such exchange? Among other things, it is because those exchanges can occur with relative ease and frequency, features that are facilitated by having concentrations of people near each other geographically. It is, in a very real sense, a matter of transportation. Recalling that the first real cities depended upon a surplus of food that could be exchanged for nonagricultural goods and services, those exchanges could only occur through a certain amount of transportation: both the farmer and the tradesperson had to get their respective offerings to the point of exchange and home again. Hence, transportation became one of the early transaction costs<sup>40</sup> underlying the emerging market system. As with other nonproductive costs, emphasis was placed on being able to keep transportation costs as low as possible. Cities, as it turns out, were adept at keeping transportation costs relatively low: the closer in geographic proximity of producer and consumer, the less travel needed to consummate a transaction.<sup>41</sup>

Cities facilitate frequent exchanges because in cities those exchanges can occur with a minimum amount of transportation: the locus of human interaction—be it in the marketplace, the local pub, the university, or the place of worship—is close and convenient enough for many to have ready and repeated access to it. The closer the place of exchange is, the less travel required to access it, making it more convenient and resulting in increased levels of exchange opportunities. Hence, the level of exchanges and the amount of travel required to achieve them appear to have an inverse relationship: beyond a certain minimum level of movement, the level of exchange seems to decrease as the amount of travel (measured in time or distance) increases.<sup>42</sup> As author/activist David Engwicht aptly observes: “[C]ities are an invention to *maximise exchange* (culture, goods, friendship, knowledge) and *minimise travel*.”<sup>43</sup> To put it into the language of mobility and accessibility, cities provide an environment that is access efficient: they offer the greatest

amount of access to the places people need to go with the lowest amount of mobility.

From this perspective, it would appear that the primary function of transportation planning would be to reduce the amount of travel needed to accomplish the exchanges that make for a meaningful life. Traditional transportation planning processes, however, have not focused on exchange, but on the trips in between exchanges, almost as if the trips themselves were the whole point. Very little attention has been paid to why the trips are occurring at all, or why the people making the trips are traveling. Instead, most transportation planning exercises have focused on a narrow understanding of reducing travel costs, usually those associated with congestion. Because of this focus, traditional transportation planning has inadvertently worked to increase the amount of travel needed for daily life, not decrease it.

## II. Federal Law and Transportation Systems Planning

### A. Early Efforts

At least at a project level, transportation planning has been occurring in the United States for some time. Certainly the early turnpike roads built in Pennsylvania and Virginia in the late 18th century,<sup>44</sup> and the Transcontinental Railroad in the middle of the 19th century,<sup>45</sup> required a great deal of planning and engineering. The first significant systematic planning effort, however, began as the result of the Federal-Aid Highway Act of 1934<sup>46</sup> with a series of statewide highway planning surveys done cooperatively by the U.S. Bureau of Public Roads (precursor to the Federal Highway Administration (FHWA)) and individual state highway departments.<sup>47</sup> These surveys mapped out the extent and physical characteristics of the highways within each state, and made some effort to quantify the volume of traffic on the various facilities. The cumulative result of these cooperative federal-state efforts was the beginning of a rudimentary nationwide highway plan. This initiative was soon dwarfed by the planning and engineering undertaken to construct the Interstate Highway System, which was authorized by Congress in 1944<sup>48</sup> but did not receive significant funding until the Federal-Aid Highway Act of 1956.<sup>49</sup>

While these efforts were distinct from their project-oriented predecessors in that they focused on entire systems, the focus was not on the daily travel needs of Americans going to and from their daily tasks.<sup>50</sup> Rather, with respect to the

39. OLIVER WENDELL HOLMES JR., SPEECHES BY OLIVER WENDELL HOLMES 85-86 (speech to Bar Association of Boston, March 7, 1900) (Kessinger Publishing 2004), quoted in JANE JACOBS, THE DEATH AND LIFE OF GREAT AMERICAN CITIES 2 (Vintage Books 1992) (1961).

40. See P.K. RAO, THE ECONOMICS OF TRANSACTION COSTS: THEORY, METHODS, AND APPLICATIONS 9 (2006) (“[Transaction costs] are pervasive at all levels and types of activity (and inactivity) or transaction: costs of establishing, maintaining, adapting, regulating, monitoring, devising enforcing rules, and executing transactions.”).

41. HARLEY SHERLOCK, CITIES ARE GOOD FOR US: THE CASE FOR CLOSE-KNIT COMMUNITIES, LOCAL SHOPS, AND PUBLIC TRANSPORT 27 (Paladin 1991); SANDRA NIEWIEM, THE CONTRACTUAL RELATIONSHIP BETWEEN CLIENTS AND MANAGEMENT CONSULTANTS: A TRANSACTION COST ECONOMIC ANALYSIS 53 (2005).

42. See David Engwicht, *Access Efficiency Enhancement: More Saleable Than “Demand Management” and Proving a New Suite of Systemwide Indicators*, in 1991 INTERNATIONAL TRANSPORT CONFERENCE: TRANSPORT SHAPING AUSTRALIA—ISSUES AND OPPORTUNITIES 2 (1991); Hanson, *supra* note 7, at 5-8.

43. DAVID ENGWICHT, RECLAIMING OUR CITIES AND TOWNS: BETTER LIVING WITH LESS TRAFFIC 12-13 (New Society Publishers 1993).

44. See FEDERAL HIGHWAY ADMIN. (FHWA), U.S. DOT, AMERICA’S HIGHWAYS 1776-1976, at 8-10 (U.S. Gov’t Printing Office 1976) [hereinafter FHWA].

45. See generally DAVID HAWARD BAIN, EMPIRE EXPRESS: BUILDING THE FIRST TRANSCONTINENTAL RAILROAD (Penguin 1999).

46. Ch. 586, §11, 73 Pub. L. No. 393, 48 Stat. 993, 995 (1934) (alternatively referred to as the Hayden-Cartwright Act of 1934); see FHWA, *supra* note 44, at 265, 268-69.

47. FHWA, *supra* note 44, at 265; see EDWARD WEINER, URBAN TRANSPORTATION PLANNING IN THE UNITED STATES: AN HISTORICAL OVERVIEW 8 (revised ed., Praeger Publishers 1999).

48. Federal-Aid Highway Act of 1944, ch. 626, §7, 78 Pub. L. No. 521, 58 Stat. 838, 842.

49. Ch. 462, §108, 84 Pub. L. No. 627, 70 Stat. 374, 378-82; see WEINER, *supra* note 47, at 13.

50. WEINER, *supra* note 47, at 13-14 (“The importance of the system within cities was recognized, but it was not intended that these [in-

Interstate Highway System, the objective was to create a system “which best and most directly join[s] region with region and major city with major city.”<sup>51</sup> Moreover, the planning completely ignored important non-highway transportation systems such as waterways, local arterials, and public transit. More to the point, all these planning efforts were pursued to construct facilities that would accommodate mobility; there was little to no interest in examining ways to reduce the need to travel.<sup>52</sup>

The real shift in the discipline came with the Federal-Aid Highway Act of 1962.<sup>53</sup> Under this Act, metropolitan areas<sup>54</sup> were required, as a condition for receiving federal funding, to adopt long-range transportation plans for entire urban areas and for multiple modes of transportation.<sup>55</sup> Rather than sporadic planning for a particular project (or even a specific system, such as the Interstate Highway System), the planning required under the Act was to be multimodal and continuing, comprehensive, and cooperative (the 3 Cs).<sup>56</sup> Just as important was the systematic incorporation of the effects that land use patterns have on travel demand.<sup>57</sup> Though several significant transportation studies pioneered “hyphenated” land use transportation analyses in the 1950s,<sup>58</sup> the incorporation of land use influences into transportation planning was routinized through the 1962 Act and subsequent implementing technical memoranda and procedural manuals developed by the Bureau of Public Roads.<sup>59</sup> In addition, there was a growing recognition of the community and social impacts that highway construction was having on urban areas, and a broader understanding of the need for highways to be better integrated with their surroundings.<sup>60</sup> Despite these fundamental changes, however, the primary purpose of transportation planning remained focused on mobility and on ways to accommodate growing travel, primarily by automobile.<sup>61</sup>

The modern practice of transportation systems planning came of age in the decades following passage of the 1962 Act. That practice was focused on the development of multimodal transportation systems; it was facilitated and quantified by increasingly robust computer models; and it was executed by a new governmental entity created to meet the needs of the 3C planning process: the metropolitan planning organization (MPO).<sup>62</sup> The rise of MPOs in the early 1970s grew out of a combination of increased environmental awareness, mounting resistance to urban highway construction, and heightened concern over the financial health of transit companies recently taken over by cities and other governmental entities.<sup>63</sup> Prior to the formal recognition of MPOs in federal law, the regional intergovernmental bodies that facilitated the 3C process were playing, at most, technical and advisory roles: “This left the crucial day-to-day decisions about allocating funding and choosing projects largely to highway-oriented state officials.”<sup>64</sup> In a fractious debate over reauthorization of federal transportation legislation in 1972-1973, a combination of urban, community, and environmental constituencies pushed to have these ad hoc regional bodies formally recognized in federal law, universalized to all metropolitan areas, and empowered to have decisionmaking authority.<sup>65</sup> Once MPOs were formally recognized, a number of federal programs requiring regional planning came within their purview, in addition to transportation.<sup>66</sup> This golden era of MPOs, however, was short-lived. With the “new federalism” promoted by the Reagan Administration, MPOs lost most of the programs they briefly controlled.<sup>67</sup> The one program remaining was transportation planning, but new regulations gave states full sway in determining the functions for MPOs. This meant that many MPOs were in the role of merely rubber-stamping decisions already made by state highway departments.<sup>68</sup>

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terstate] highways serve urban commuter travel demands in the major cities.”).

51. H.R. Doc. No. 78-379, at 5 (1944) (report of the National Interregional Highway Committee).
52. See FHWA, *supra* note 44, at 264 (“The ultimate result of highway planning . . . is the development of a highway system to provide for the movement of vehicles . . .”).
53. 87 Pub. L. No. 866, 76 Stat. 1145.
54. The specific reference in the Act is to “urban area[s] of more than fifty thousand population.” *Id.* §9(a), 76 Stat. at 1148.
55. *Id.*; WEINER, *supra* note 47, at 33. *But cf.* FHWA, *supra* note 44, at 308 (“The 1962 Act was not a new congressionally conceived requirement, but rather an endorsement of a process already being proved effective in many areas.”).
56. 87 Pub. L. No. 866, §9(a), 76 Stat. at 1148.
57. See WEINER, *supra* note 47, at 34-37.
58. See *id.* at 35; FHWA, *supra* note 44, at 280-81.
59. BUREAU OF PUBLIC ROADS, U.S. DEP’T OF COMMERCE (DOC), INSTRUCTIONAL MEM. NO. 50-2-63, URBAN TRANSPORTATION PLANNING (1963), *superseded by* FHWA, U.S. DOT, POLICY AND PROCEDURE MEM. NO. 50-9, URBAN TRANSPORTATION PLANNING (1967).
60. See *generally* AMERICAN ASS’N OF STATE HIGHWAY OFFICIALS ET AL., FREEWAYS IN THE URBAN SETTING: HERSHEY CONFERENCE (Automotive Safety Foundation 1962).
61. See BUREAU OF PUBLIC ROADS, U.S. DOC, HIGHWAY PLANNING PROGRAM MANUAL (1963); see also MARK SOLOF, HISTORY OF METROPOLITAN PLANNING ORGANIZATIONS 16 (North Jersey Transportation Planning Authority 1997), available at [http://www.njtpa.org/public\\_affairs/mpo\\_history/MPOhistory1998.pdf](http://www.njtpa.org/public_affairs/mpo_history/MPOhistory1998.pdf); WEINER, *supra* note 47, at 42 (“The goal for the overall highway planning process was to develop a master plan for highway development.”).

62. Federal-Aid Highway Act of 1973, Pub. L. No. 93-87, §112, 87 Stat. 250, 257; 23 C.F.R. §450.104(b) (1976); SOLOF, *supra* note 61, at 21.
63. SOLOF, *supra* note 61, at 21.
64. *Id.*
65. Federal-Aid Highway Act of 1973, §§109(a), (b), 112, 87 Stat. at 250, 255. For the initial set of DOT regulations implementing MPO portions of the Act, see Planning Assistance and Standards, 40 Fed. Reg. 42976-84 (Sept. 17, 1975) (codified at 23 C.F.R. §§450.100-.320 (1976)).
66. *E.g.*, Housing and Urban Development Act of 1965, Pub. L. No. 89-117, §1102(c)(1), 79 Stat. 502 (providing for data collection and planning “for the solution of . . . metropolitan or regional problems”); Demonstration Cities and Metropolitan Development Act of 1966, Pub. L. No. 89-754, §204, 80 Stat. 1262-63 (requiring regional agency review of local government applications for approximately 40 federal grant programs); Intergovernmental Cooperation Act of 1968, Pub. L. No. 90-577, 82 Stat. 1098-107 (as implemented through the Bureau of the Budget’s Circular A-95 (33 Fed. Reg. 16487 (Nov. 13, 1968)), extending regional review to more than 150 federal grant programs); see PAUL G. LEWIS & MARY SPRAGUE, FEDERAL TRANSPORTATION POLICY AND THE ROLE OF METROPOLITAN PLANNING ORGANIZATIONS IN CALIFORNIA 29-30 (Public Policy Institute of California 1997).
67. Bruce D. McDowell, *The Metropolitan Planning Organization Role in the 1980s*, 18 J. ADVANCED TRANSP. 125, 128 (1984) (“The latest comprehensive study of the federal programs supporting regional planning . . . showed that there were 39 such programs in 1979. Only one of those programs now remains . . .”).
68. SOLOF, *supra* note 61, at 26.

### B. *The Clean Air Act*

Although important institutional changes occurred in the 1970s and 1980s that directly impacted transportation planning—most notably the creation of MPOs—most of the policy and procedural changes that occurred during those decades were imposed by broader environmental legislation that affected project planning, i.e., how/whether to construct a specific project, not systems planning.<sup>69</sup> The first major policy directive targeted at transportation systems planning since the 1962 Act came as part of the Clean Air Act (CAA) Amendments of 1990.<sup>70</sup> Though substantial progress had been made in cleaning up the air since the passage of the CAA of 1970, in 1990, 96 metropolitan areas still failed to meet national ambient air quality standards (NAAQS) for ozone and 41 failed to meet NAAQS for carbon monoxide (CO)—both pollutants associated with transportation sources.<sup>71</sup> To remedy these failings, the CAA Amendments strengthened two components from earlier versions of the CAA, potentially turning each from being minor check-offs into major influences in transportation system planning processes. The first was part of a new sliding scale compliance schedule for metropolitan areas out of attainment with NAAQS: those areas classified as “severe” or “extreme” for ozone, or “serious” for CO had to adopt transportation control measures (TCMs) to offset projected growth in vehicle travel over the course of the planning horizon.<sup>72</sup> Metropolitan areas could select from a long list of TCMs enumerated in the CAA Amendments, including programs to improve public transit and other alternative transportation modes, restrict automobile use in downtown areas, and “generally reduce the need for single-occupant vehicle travel, as part of transportation planning and development efforts of a locality, including programs and ordinances applicable to new shopping centers, special events, and other centers of vehicle activity.”<sup>73</sup> Although this latter option lends itself to an access-efficient outcome—facilitating access to needed destinations while working to reduce vehicle travel—the measure is only one of many possible options and the literature suggests that few regions have opted to employ it.<sup>74</sup>

A second and further reaching change imposed by the CAA Amendments on transportation planning came from alterations in the provisions on “transportation air quality conformity.” Under the CAA of 1977, conformity generally prohibited direct inconsistencies between long-range transportation system plans and the state implementation plans

(SIPs) developed by states to come into compliance with NAAQS.<sup>75</sup> The CAA Amendments changed the conformity provisions by requiring that transportation plans conform to “a SIP’s purpose of eliminating and reducing the severity and number of violations of the NAAQS and achieving expeditious attainment of the standards.”<sup>76</sup> Hence, instead of merely avoiding direct conflicts between transportation and air quality plans, the new conformity provisions created an affirmative duty for transportation planners to create plans that would work to achieve the aims of providing citizens with healthy air.<sup>77</sup> Though not specifically targeted at the tension between mobility and accessibility, the new conformity provisions at least gave impetus and context in which those issues could be engaged.

### C. *ISTEA, TEA-21, SAFETEA-LU, and Other Beverages*

The second most important change in transportation systems planning since 1962 followed closely on the heels of the CAA Amendments. The Intermodal Surface Transportation Efficiency Act (ISTEA) of 1991<sup>78</sup> revolutionized the rules for transportation systems planning, at least on the surface. Although the actual on-the-ground changes that resulted from ISTEA (and subsequent transportation bills) were slight, ISTEA and its progeny at least facilitated a framework for shifting to an accessibility-based planning system.

ISTEA changed system planning processes through two primary mechanisms. First, it changed the rules about funding eligibility for different transportation modes. Prior transportation authorization bills contained strict modally based funding categories that allowed minimal to no crossover from one category/mode to the next.<sup>79</sup> For example, ISTEA’s predecessor, the Surface Transportation and Uniform Relocation Assistance Act of 1987,<sup>80</sup> contained more than 14 different highway construction funding categories,<sup>81</sup> 4 bridge construction programs,<sup>82</sup> 2 highway safety programs,<sup>83</sup> and 4 transit programs.<sup>84</sup> Each of these funding programs contained strict definitions of the types of transportation projects that could be funded through the program, allowing little or no flexibility to use the funds for other types of projects; for the most part, variations from the strict allocation rules required specific legislative authorization.<sup>85</sup> This high level of inflexibility created problems for local and metropolitan transportation planners. Not infrequently,

69. *E.g.*, Endangered Species Act of 1973, Pub. L. No. 93-205, 87 Stat. 884 (codified at 16 U.S.C. §§1531-1543, ELR STAT. ESA §§2-18); Federal Water Pollution Control Act Amendments of 1972, Pub. L. No. 92-500, 86 Stat. 816 (codified at 33 U.S.C. §§1251-1387, ELR STAT. FWPCA §§101-607); National Environmental Policy Act of 1969, Pub. L. No. 91-190, 83 Stat. 852 (1970) (codified at 42 U.S.C. §§4321-4344, ELR STAT. NEPA §§2-209).

70. 42 U.S.C. §§7401-7671q, ELR STAT. CAA §§101-618; see Robert Johnston, *The Urban Transportation Planning Process*, in THE GEOGRAPHY OF URBAN TRANSPORTATION, *supra* note 7, at 115, 119.

71. U.S. Environmental Protection Agency (EPA), *Highlights of the 1990 Clean Air Act Amendments*, EPA J., Jan./Feb. 1991, available at <http://www.epa.gov/history/topics/caa90/01.htm>.

72. 42 U.S.C. §§7511a(d)(1)(A), (e), 7512a(b)(2).

73. 42 U.S.C. §7408(f)(1)(A).

74. See generally K.K. KNAPP ET AL., USE AND EVALUATION OF TRANSPORTATION CONTROL MEASURES (1994).

75. WEINER, *supra* note 47, at 170.

76. *Id.*

77. See 42 U.S.C. §7506(c)(2).

78. 102 Pub. L. No. 240, 105 Stat. 1914.

79. BRUCE KATZ ET AL., TEA-21 REAUTHORIZATION: GETTING TRANSPORTATION RIGHT FOR METROPOLITAN AMERICA 3 (Brookings Institution 2003).

80. 100 Pub. L. No. 17, 101 Stat. 132.

81. *Id.* §§104, 106, 101 Stat. at 142, 144-45.

82. *Id.* §123, 101 Stat. at 161-64.

83. *Id.* §202(a), 101 Stat. at 218.

84. *Id.* §328, 101 Stat. at 238-39.

85. See, e.g., *id.* §141(b), 101 Stat. at 176 (allowing California to use Interstate Construction funds for a transit project in Los Angeles); *id.* §142, 101 Stat. at 177 (allowing Oregon to use Interstate Construction funds for a transit project in Portland).

the greatest local/regional transportation needs did not match up with the categories and funding priorities in the federal bill. With the overwhelming amount of total funding allocated to highway construction categories,<sup>86</sup> regions were essentially induced to develop highway expansion solutions to transportation problems, even when other approaches may have been more appropriate and effective.

ISTEA marked a significant departure from this practice by substantially increasing funding flexibility: the three largest funding programs in the Act—the National Highway System,<sup>87</sup> the Surface Transportation Program,<sup>88</sup> and §9 transit formula funds<sup>89</sup>—totaling nearly \$60 billion (nearly 40% of funding in the entire bill) could be used to fund virtually any surface transportation capital improvement, regardless of mode. This step toward mode neutrality in federal funding was intended to at least partially “unload the dice” in local and regional transportation planning: federal funding restrictions should no longer stand in the way of the most appropriate solution to transportation problems.<sup>90</sup> While the increased flexibility authorized substantial reallocations of funds away from roads to transit and other alternative modes, states and MPOs actually shifted very few dollars to non-highway projects—the overwhelming majority of the money stayed on the highway side of the ledger.<sup>91</sup>

The second major change made by ISTEA was the significant expansion of factors that had to be considered in long-range transportation planning processes for metropolitan areas. This expansion required both the incorporation of a broader range of issues and more in-depth analysis. Prior to ISTEA, federal legislation required only that metropolitan transportation planning be continuous, cooperative, and coordinated. ISTEA required consideration of no fewer than

15 detailed factors, covering a number of diverse topics, including facility preservation, international border crossings, and facility security.<sup>92</sup> Of particular interest was Factor 4: “The likely effect of transportation policy decisions on land use and development and the consistency of transportation plans and programs with the provisions of all applicable short- and long-term land use and development plans.”<sup>93</sup> According to the U.S. Senate Committee on Environment and Public Works, which developed this language,<sup>94</sup> the intent was for MPOs to

demonstrate that capacity expansion will not be accompanied by increased development in a manner that will frustrate the goals of expansion. MPO plans should also specify how land use plans may encourage any necessary travel demand reduction or encourage the use and financial viability of mass transportation and non-motorized travel.<sup>95</sup>

As illuminated by the committee explanation, the requirement of Factor 4 went much further than merely requiring recognition that land use patterns influence travel behaviors, as the prior 3C planning guidelines did. It called on MPOs to guard against planning and building facilities that might induce land development that could create excessive travel on the proposed facility. It also sought to have MPOs investigate future land use patterns that might reduce the need to travel. In other words, the objective was to have MPOs incorporate into their transportation system planning processes ways to increase accessibility while reducing the need for mobility—to increase exchange, while minimizing travel.

The FHWA regulations implementing Factor 4, however, did not go as far as the Senate Committee explanatory language suggested, opting instead to focus on the need for transportation system plans to be consistent with local land use plans.<sup>96</sup> Mere consistency, of course, does not ensure incorporation of accessibility-related goals. If local land use plans call for increasingly dispersed and isolated development, all that consistency would seem to require is that transportation plans contain enough highway lane miles to service the mobility needs generated by that development. In short, the regulations were more focused on process issues related to horizontal policy consistency than on the substance of facilitating accessibility.

86. The Surface Transportation and Uniform Relocation Assistance Act of 1987 authorized the expenditure of \$17 billion to Interstate Highway construction, *id.* §104, 101 Stat. at 142, \$53.2 billion for other highway construction and rehabilitation programs, *id.* §106, 101 Stat. at 144-45, and \$17.87 billion for transit programs, *id.* §328, 101 Stat. at 238-39.

87. ISTEA §1006(d), (f), 105 Stat. at 1925-27.

88. *Id.* §1007(a)(1), 105 Stat. at 1927-28.

89. *Id.* §3013(h), 105 Stat. at 2107.

90. See H.R. REP. NO. 102-171, pt. 1, at 6 (1991), reprinted in 1991 U.S.C.C.A.N. 1526, 1531:

The Committee feels that one of the most important things this legislation can do is give state and local officials the flexibility to make the crucial decisions on how their funds should be used. They will have the ability to choose the best transportation solution without the artificial constraints of funding categories.

An additional method used in ISTEA to promote mode neutrality was to equalize federal match ratios across modes at 80%. Prior to ISTEA, highway construction projects enjoyed [an 80-90%] federal match ratio, while transit was limited to 75% and on many projects was considerably lower. *Id.* at 23, 1991 U.S.C.C.A.N. at 1549:

[T]he current inequitable shares cause a bias toward project selection for projects with higher Federal shares, which usually results in a highway project being chosen over a transit project. . . . The bill sets Federal matching shares for virtually all the highway and transit programs at 80%. . . . [T]he uniform share creates a fair framework for making project decisions.

91. SURFACE TRANSPORTATION POLICY PROJECT, CHANGING DIRECTION: FEDERAL TRANSPORTATION SPENDING IN THE 1990s, at 6 (2000) (“[L]ess than 7 percent of this “flexible” funding has gone to providing new transportation alternatives. Almost 90 percent has gone to traditional highway projects.”).

92. ISTEA §1024(a), 105 Stat. at 1957-58.

93. *Id.*

94. See H.R. REP. NO. 102-404, at 319 (1991) (Conf. Rep.), reprinted in 1991 U.S.C.C.A.N. 1679, 1699.

95. S. REP. NO. 102-71, at 29 (1991).

96. Statewide Planning; Metropolitan Planning, 58 Fed. Reg. 58040, 58072 (Oct. 28, 1993) (codified at 23 C.F.R. §450.316(a)(4)) (2006):

The likely effect of transportation policy decisions on land use and development and the consistency of transportation plans and programs with the provisions of all applicable short- and long-term land use and development plans (the analysis should include projections of metropolitan planning area economic, demographic, environmental protection, growth management, and land use activities consistent with metropolitan and local/central city development goals (community, economic, housing, etc.), and projections of potential transportation demands based on the interrelated level of activity in these areas).

(superseded by 72 Fed. Reg. at 7224).

ISTEA was followed in 1998 by the Transportation Equity Act for the 21st Century (TEA-21).<sup>97</sup> Although the metropolitan planning provisions of TEA-21 followed the general pattern of ISTEA,<sup>98</sup> the factors to be considered in the development of long-range plans were “streamlined”<sup>99</sup> from 15 to 7.<sup>100</sup> Gone from the list was consideration of land use patterns in any form. The only provision that even hinted at land use was Factor D, which implored MPOs to consider improved quality of life in their planning processes.<sup>101</sup> The Conference Committee for TEA-21 explained that this general reference was intended to include “the interaction between transportation decisions and local land use decisions appropriate to each area,”<sup>102</sup> but, the committee hastened to add, MPOs are only encouraged to consider such interactions.<sup>103</sup> This permissive intention was further communicated by the very next subsection of the Act, which explicitly barred court action to enforce consideration of any of the planning factors.<sup>104</sup> Interestingly, the FHWA chose to not alter its planning regulations in response to TEA-21 and retained the pre-TEA-21 requirement urging mere consistency with local land use plans.<sup>105</sup>

The legislation that replaced TEA-21 was hard won and long overdue. Although the funding authorization provisions of TEA-21 expired in federal fiscal year 2003, it was not until August 2005 before Congress finally adopted replacement legislation. As with TEA-21, the new (and now current) Act, the Safe, Accountable, Flexible, Efficient Transportation Equity Act: A Legacy for Users (SAFETEA-LU),<sup>106</sup> was intended to continue many of the innovations created in ISTEA.<sup>107</sup> SAFETEA-LU expanded slightly on the planning factors in TEA-21, adding one<sup>108</sup> and providing slight modifications to the preexisting seven factors. TEA-21’s Factor D, now renumbered Factor E, was expanded to explicitly incorporate land use considerations: long-range planning processes now need to consider projects and strategies that will “protect and enhance the environment, promote energy conservation, improve the quality of life, and promote

consistency between transportation improvements and State and local planned growth and economic development patterns.”<sup>109</sup> This new language more or less codifies the FHWA’s interpretation of the previous version of this factor from TEA-21.<sup>110</sup> It does not, however, include ISTEA’s requirement for considering possible land development impacts of planned transportation facilities. Nor does it include the Committee on Environment and Public Works’ understanding of the parallel factor from ISTEA—that planners should investigate ways to use land use planning and development to reduce travel or to encourage increased transit ridership.<sup>111</sup> In short, federal transportation planning mandates appear to have no lever that would encourage—let alone require—the development of an access-efficient transportation planning process. This is, in part, why some commentators have opined that recent transportation policy reforms, while significant, are nevertheless disappointing.<sup>112</sup>

### III. The Four Policy Forces of Transportation

So what would an access-efficient transportation planning process look like? Answering that question requires identification of the factors that influence transportation choices and patterns. Why do people travel how they do, when they do, and where they do? As observed above, very few people engage in intra-metropolitan travel for the sheer pleasure of it. Something other than the delight of navigating urban byways and bus systems is propelling them to be mobile. Answering the question by observing the purposes for trip making—work, school, shopping, culture—is, of course, important,<sup>113</sup> but that does not completely answer the questions of how, when, and where. Developing an access-efficient transportation planning system requires further investigation into those questions.

At the most general level, travel behavior varies according to two primary factors: the characteristics of the traveler and the nature of the policy, economic, and physical environment in which they are traveling.<sup>114</sup> The first of these two factors, traveler-related characteristics, can best be understood in demographic terms, looking principally at issues of household income and size; the number of workers, cars, and school-age children per household; and the age of household members.<sup>115</sup> Generally speaking, increased automobile driving per household—as measured both by the frequency of trips and the amount of miles traveled—is associated with the following variations in household characteristics: higher income, larger households, more workers, more cars, more young children, and more adults under the age of

97. 105 Pub. L. No. 178, 112 Stat. 107 (1998).

98. H.R. REP. NO. 105-550, at 439 (1998) (Conf. Rep.), reprinted in 1998 U.S.C.A.N. 70, 113 (the Conference Committee version of the bill “retains the basic current metropolitan planning structure and processes”).

99. *Id.*

100. TEA-21, §1203(f), 112 Stat. at 174.

101. *Id.*

102. H.R. REP. NO. 105-550, at 439-40 (1991), reprinted in 1991 U.S.C.A.N. at 113.

103. *Id.*

104. TEA-21, §1203(f), 112 Stat. at 174:

The failure to consider any factor specified in paragraph (1) shall not be reviewable by any court under this title, subchapter II of chapter 5 of title 5, or chapter 7 of title 5 in any matter affecting a transportation plan, a transportation improvement plan, a project or strategy, or the certification of a planning process.

105. 23 C.F.R. §§450.316(a)(4), 450.322(a), (b)(9) (2006), superseded by 72 Fed. Reg. at 7224.

106. Pub. L. No. 109-59, 119 Stat. 1144 (2005).

107. See FHWA, U.S. DOT, MEMORANDUM: FLEXIBLE FUNDING FOR HIGHWAYS AND TRANSIT AND FUNDING FOR BICYCLE AND PEDESTRIAN PROGRAMS (2006), available at <http://www.fhwa.dot.gov/sep/flexfund.htm>.

108. The new planning factor explicitly incorporates facility safety and security into the planning process. SAFETEA-LU §6001(a), 119 Stat. at 1844, 23 U.S.C.A. §134(h)(1)(C) (West 2006).

109. *Id.*

110. Cf. 23 C.F.R. §450.316(a)(4) (2006). In a somewhat circular fashion, the new FHWA regulations to implement the planning factors from SAFETEA-LU parrot the statutory language. See 72 Fed. Reg. at 7270 (to be codified at 23 C.F.R. §450.306(a)(5)).

111. S. REP. NO. 102-71, at 29 (1991).

112. KATZ ET AL., *supra* note 79, at 4.

113. Gerald Barber, *Aggregate Characteristics of Urban Travel*, in THE GEOGRAPHY OF URBAN TRANSPORTATION 81, 83 (Susan Hanson ed., 2d ed., Guilford Press 1995) (“It is common to classify individual trips made in a city into one of several categories based on the purpose of the trip . . .”).

114. Susan Hanson & Margo Schwab, *Describing Disaggregate Flows: Individual and Household Activity Patterns*, in THE GEOGRAPHY OF URBAN TRANSPORTATION, *supra* note 113, at 166, 167.

115. *Id.*

65.<sup>116</sup> Households that exhibit higher values for each of these demographic characteristics tend to have more and longer car trips than households with lower values for the same characteristics. In most analyses, these demographic factors have been shown to have a stronger influence on personal travel decisions than policy, economic, and physical environmental factors—the other primary set of influences on travel choice.<sup>117</sup>

Given the apparent strength of demographic factors in affecting travel, incorporating them into transportation planning processes would be important, and virtually all transportation planning agencies do just that. Demographic factors alone, however, do not explain all the variation in travel patterns, and they work poorly as variables in a policy intervention context. For example, despite the important role that household size and income play in setting travel patterns, no one would seriously propose policies that intentionally aim to reduce household size or income to reduce the amount of travel and congestion.<sup>118</sup> By contrast, the policy, economic, and physical environmental factors that shape travel patterns are much more readily subject to policy interventions, and hence, are capable of being used variably to achieve specified planning objectives, such as increasing access efficiency. These environmental factors can be grouped into four basic categories: infrastructure, cost, education, and land use. Like many classifications, however, there is significant overlap between these categories.

#### A. Infrastructure

The influence of infrastructure on travel is understood by the very basic observation that one cannot drive on a street that does not exist or ride on a bus that does not run.<sup>119</sup> Transportation infrastructure provides the basic hardware that makes traveling possible. The provision of infrastructure, however, goes beyond mere facilitation: it appears to have a significant influence on decisions people make about how, when, and where to travel. In short, the amount and nature of transportation infrastructure can affect the amount and nature of demand to use that infrastructure.

For decades, transportation planning has been based on an assumption of constant demand. That is, that the amounts of demand for travel in general and travel by a particular

mode were more or less set by the demographic features outlined above. Using this approach, it was the transportation planner's job simply to provide the infrastructure necessary to accommodate that preset demand.<sup>120</sup> Probably the most visible proponent of this practice was Robert Moses, the revered (and reviled) head of the New York Triborough Bridge Authority.<sup>121</sup> His view was that the future of transportation lay with the automobile, and that it was necessary to construct the facilities needed to realize that future. Moses' problem was congestion. His observation that existing roads and bridges were over capacity led him to propose grand networks of new roads and bridges to accommodate the demand, many of which were constructed. Much to his dismay, however, the new facilities did little to relieve pre-existing congestion problems.<sup>122</sup> Moreover, the new facilities themselves often became congested very quickly.<sup>123</sup> This meant that instead of reducing congestion, the new construction had resulted in a net increase in congestion.

It turns out that instead of demand remaining at some fixed rate, influenced only by the features of household economics and structure, it responds to the amount and nature of the supply provided. According to Down's Law, demand for travel expands to fill the capacity provided to it.<sup>124</sup> In other words, to borrow from popular culture: "[I]f you build it, they will come."<sup>125</sup>

Where does the extra traffic come from? Are there people "in the wings" just waiting to drive onto a new highway once it is opened? The answer is more or less "yes." When a significant amount of new capacity is added to a transportation system, travel on the new facility is easier and quicker compared to other travel options, at least initially. Because people, to a large degree, make travel choices that optimize for speed and convenience,<sup>126</sup> they are apt to change their behaviors to take advantage of the new capacity. Those behavioral changes express themselves in short-term shifts in daily travel patterns, medium-term changes in trip origins and destinations, and long-term structural changes in land development patterns.

The short-term changes are threefold: travelers will take advantage of the new or expanded facility by changing their time of travel, their travel mode, or their travel route.<sup>127</sup> The temporal shifts occur among travelers who formerly avoided rush-hour congestion by traveling at other times. The improved speed and convenience of the new facility accommodates those who would prefer to travel during the peak time. Similar shifts occur among travelers who formerly used modes of travel other than the one improved by the capacity expansion. The increased capacity to that one mode increases its relative attractiveness compared to other

116. See *id.* at 168; Marsha Dale Anderson, *Urban Travel Characteristics*, in *TRANSPORTATION PLANNING HANDBOOK* 58, 67 (Institute of Transportation Engineers 2d ed. 1999).

117. TRANSPORTATION RESEARCH BD., *EXPANDING METROPOLITAN HIGHWAYS: IMPLICATIONS FOR AIR QUALITY AND ENERGY USE* 140 (National Academy Press 1995); see 1,000 FRIENDS OF OREGON, *MAKING THE LAND USE, TRANSPORTATION, AIR QUALITY CONNECTION: THE PEDESTRIAN ENVIRONMENT* 32 (1993) (regression analysis shows economic/demographic factors have a stronger impact on vehicle miles traveled than environmentally related factors). *But cf.* Susan Handy, *Understanding the Link Between Urban Form and Nonwork Travel Behavior*, 15 *J. PLAN. EDUC. & RES.* 183 (1996) (effects of household economic/demographic conditions are less than the effect of neighborhood design for trip time, frequency, and destination).

118. DOWNS, *supra* note 4, at 11 ("[T]he quickest way for a region to reduce intensive congestion is to encounter a serious recession—hardly a remedy anyone desires.").

119. Ming Zhang, *Intercity Variations in the Relationship Between Urban Form and Automobile Dependence*, 1902 *TRANSP. RES. REC.* 55 (2005) ("Lack of viable travel alternatives to driving is a main reason (or excuse) for many to depend on their automobiles.").

120. MARLON G. BOARNET & RANDALL CRANE, *TRAVEL BY DESIGN: THE INFLUENCE OF URBAN FORM ON TRAVEL* 4 (2001).

121. See generally ROBERT A. CARO, *THE POWER BROKER: ROBERT MOSES AND THE FALL OF NEW YORK* (Vintage Books 1975).

122. See *id.* at 563.

123. See *id.* at 564.

124. Anthony Downs, *The Law of Peak-Hour Expressway Congestion*, 16 *TRAFFIC Q.* 393, 393 (1962).

125. W.P. KINSELLA, *SHOELESS JOE* 3 (Houghton Mifflin 1982); *Field of Dreams* (Universal Pictures 1989).

126. See BOARNET & CRANE, *supra* note 120, at 61-62.

127. See DOWNS, *supra* note 4, at 82-86; TRANSPORTATION RESEARCH BD., *supra* note 117, at 144.

modes. Hence, the new or expanded facility will provide for transportation that for some travelers, is faster and easier than competing modes. This will encourage those travelers to switch to the improved mode. Route changes occur for the same reasons: travelers of other, parallel routes will be encouraged to switch to the improved facility to take advantage of its higher speeds and greater convenience. Commuters regularly experience this type of route shift when they respond to radio traffic reports by altering their travel routes to avoid congestion and vehicle crashes. Together, these three short-term adjustments to travel patterns converge (hence, Downs' term "triple convergence") to soak up substantial amounts of the new capacity offered by the new or expanded facility.<sup>128</sup>

The medium-term behavioral changes resulting from significant capacity expansions are the result of shifts in the origins or the destinations of the trips carried on the facility.<sup>129</sup> Average travel times for various trip purposes, e.g., work, school, shopping, have remained relatively stable for decades, perhaps even for centuries.<sup>130</sup> This has been especially true for commute trips. Throughout the last third of the 20th century, average commute times remained steady at approximately 25-30 minutes.<sup>131</sup> Yet, during the same period, travel speeds increased appreciably, reflecting increases in travel capacity.<sup>132</sup> Obviously, this meant that travel distances also increased. While in some cases the increased commute distances reflect shifts in workplace location, they more often reflect shifts in housing location, with commuters choosing to trade the increased travel speeds for more distant residences.<sup>133</sup> The faster travel speeds also increase the likelihood that travelers will choose more distant destinations for discretionary trips, like for shopping: people can access more distant stores in the same amount of time it took formerly to travel to closer retail outlets.<sup>134</sup> In addition to longer distances, faster speeds might also mean that people will increase the number of trips they make for discretionary purposes.<sup>135</sup>

In addition to these short- and medium-term travel adjustments, adding or expanding a transportation facility usually means increasing the potential traffic flow in the vicinity of the improvement, thereby increasing the number of people who can access those places, i.e., more people can now travel to those locations within a given time frame. That increased accessibility increases the market attractiveness of

those locations.<sup>136</sup> For example, major retailers prefer highly accessible sites, as do businesses that rely on high levels of access to labor markets or for freight transportation. The increased attractiveness, however, is relative: the locations served by the new or expanded facility have increased accessibility compared to other potential locations within a given market area. This means that the newly favored locations gain a competitive edge over the others. In time, this is likely to manifest itself through additional land development in the areas surrounding the improved facility.<sup>137</sup> The new or expanded facility does not create the demand for the new development—in most cases the development would have occurred somewhere in the market area anyway. The new facility does, however, influence the location of the development—proximate to the expanded facility.<sup>138</sup> This new development, of course, will have a certain amount of travel associated with it. Depending on the development's size and type—commercial, residential, or industrial—the impacts of the added trips on surrounding transportation networks—including the newly expanded facility—could be substantial. This kind of land development, attracted by the expanded facility, is frequently referred to as induced growth and the travel it generates is referred to as induced demand.

The triple convergence of short-term shifts in travel patterns, medium-term effects on trip origins and destinations, and the long-term impacts of induced demand conspire to swamp the additional capacity provided by a new or expanded facility.<sup>139</sup> The extent to which these factors consume that capacity depends on a number of site-specific factors, particularly how congested the roads were before the expansion. However, studies estimate that the short-term effects could consume 40-50% of the new capacity<sup>140</sup>; "the longer-term effect is likely to be greater, with a higher proportion (perhaps all) of the time saved being used for further travel."<sup>141</sup> In other words, depending on local conditions, approximately one-half of the new capacity could be consumed by triple convergence and much of the rest consumed by the impacts of changes in trip origins/destinations and induced demand.<sup>142</sup>

128. DOWNS, *supra* note 4, at 82-86.

129. TERRY MOORE & PAUL THORSNES, *THE TRANSPORTATION/LAND USE CONNECTION* 23 (American Planning Ass'n 1994) ("In the long run (from one to 10 years, or longer), land uses will respond to the lower overall costs of transportation on the system. Households and businesses currently located within the urban area will consider the lower transportation costs when they decide to relocate.").

130. See Peter O. Muller, *Transportation and Urban Form*, in *THE GEOGRAPHY OF URBAN TRANSPORTATION*, *supra* note 7, at 59, 61 ("[T]he spatial extent of the continuously built-up urban area has, throughout history, exhibited a fairly constant time-distance radius of about 45 minutes' travel from the center . . .").

131. See Hanson, *supra* note 7, at 21; NEWMAN & KENWORTHY, *supra* note 17, at 27 ("In the United Kingdom, a government study found that travel time for work trips had been stable for six centuries . . .").

132. See Hanson, *supra* note 7, at 21.

133. See Barry Zondag & Martis Pieters, *Influence of Accessibility on Residential Location Choice*, 1902 *TRANSP. RES. REC.* 63 (2005).

134. DOWNS, *supra* note 4, at 104.

135. TRANSPORTATION RESEARCH BD., *supra* note 117, at 145.

136. Genevieve Giuliano, *Land Use Impacts of Transportation Investments*, in *THE GEOGRAPHY OF URBAN TRANSPORTATION*, *supra* note 7, at 237, 240-41.

137. MARLON G. BOARNET & ANDREW F. HAUGHWOUT, *DO HIGHWAYS MATTER?: EVIDENCE AND POLICY IMPLICATIONS OF HIGHWAYS' INFLUENCE ON METROPOLITAN DEVELOPMENT* 9 (Brookings Institution 2000), available at <http://www.brookings.edu/es/urban/boarnet.pdf>.

138. *Id.*

139. DOWNS, *supra* note 4, at 104 ("In the long run, road expansion could make congestion worse than it was initially.").

140. Robert Cervero, *Are Induced-Travel Studies Inducing Bad Investments?*, 22 *ACCESS* 26 (2003); ROBERT CERVERO & MARK HANSEN, *ROAD SUPPLY-DEMAND RELATIONSHIPS: SORTING OUT CAUSAL LINKAGES* (2000), available at <http://www.uctc.net/papers/444.PDF>.

141. STANDING ADVISORY COMM. ON TRUNK ROAD ASSESSMENT, *TRUNK ROADS AND THE GENERATION OF TRAFFIC* 47 (U.K. DOT 1994); see Phil B. Goodwin, *Empirical Evidence on Induced Traffic: A Review and Synthesis*, 23 *TRANSP.* 35 (1996); DOUGLAS B. LEE JR., *INDUCED TRAFFIC AND INDUCED DEMAND* (World Bank 2004), available at [http://www.worldbank.org/transport/roads/trpl\\_docs/apbinduc.pdf](http://www.worldbank.org/transport/roads/trpl_docs/apbinduc.pdf).

142. See Mark Hansen & Yuanlin Huang, *Road Supply and Traffic in California Urban Areas*, 31 *TRANSP. RES. A* 205 (1997) (regression analysis showing that 1% increase in highway capacity leads to a .9% in vehicle miles traveled in five years); see also U.S. EPA, *OUR*

Interestingly, these same relationships between supply and demand appear to apply to all transportation modes, not just to the automobile.<sup>143</sup> For example, when the Utah Transit Authority added light rail service to its system for the first time in 1999, overall transit ridership increased 17% in just one year; an additional 9% increase occurred in the year after the agency opened its second line in 2001.<sup>144</sup> Similar effects have been observed for non-motorized travel as well.<sup>145</sup> These effects in non-automobile contexts arise from the same factors observed before with respect to highways: the added capacity provided by new or expanded facilities makes travel by those modes more attractive because of actual or perceived increases in speed or convenience.

Another interesting wrinkle is that the supply-demand relationships work both directions. The “Field of Dreams” axiom referred to previously—“if you build it, they will come”—works in reverse as well, i.e., “if you tear it down, they will go away.” As with positive supply-demand cycles, the negative supply-demand effects have short-, medium-, and long-term impacts, and they appear in parallel. Where the positive cycle has triple convergence, the negative cycle has triple divergence. When the capacity of a system is reduced, due to a short-term incident, such as a vehicle crash, or a long-term event, such as the closure of a facility due to an earthquake, use of the effected part of the system becomes slower and less convenient. In the short term, this causes some former peak-hour users of that system to switch to a different travel time, mode, or route.<sup>146</sup> In the long term, the increased difficulty in accessing the affected area will tend to inspire a contraction in land use patterns: if it takes longer to get to work, commuters will be less likely to look for distant housing options and may look to move closer to their jobs, other factors being equal.<sup>147</sup>

As outlined, the provision of transportation supply through investments in infrastructure can substantially affect the choices travelers make in how, when, and where they travel. Rather than being fixed and predetermined solely by demographic influences, demand tends to follow supply to a certain degree, lending credence to those who argue that regions cannot successfully build their way out of congestion.<sup>148</sup> In the end, people make smart choices that maximize the time and convenience efficiencies of their

travel. If public policy and investment decisions indicate that traveling by a certain method is superior to other options, people will gravitate to that method. Since the 1950s, policy and investment decisions have indicated that automobile use is the superior method<sup>149</sup> and people have responded by dramatically increasing their level of driving.<sup>150</sup> This has, as noted, resulted in the dispersion of activity destinations and a general decrease in accessibility.<sup>151</sup> The infrastructure investment component of an access-efficient planning process would seek to reverse these trends by investing in modes—chiefly, transit, bicycle, and pedestrian—that tend to support a greater concentration of activities.<sup>152</sup>

### B. Cost

In transportation, as in other areas of life, people look for bargains. Less-expensive goods always have a competitive edge in the market over comparable goods that cost more. Given transportation’s status as a derived demand—one that facilitates or enables the attainment of goods but is not a good itself<sup>153</sup>—one would expect that people would be especially eager to minimize their transportation costs, more than they would for more traditional consumer goods.<sup>154</sup> To a certain degree this is true, but the relationship is somewhat complex.

Beginning with the simplest construct, people do tend to change their travel choices in response to perceptions of cost.<sup>155</sup> This is why, when headed downtown for an evening concert, people will circle the block looking for a free on-street parking spot, rather than pay to park in an off-street lot. Costs, however, are not measured merely by dollar outlays; time and convenience are costs, too, which people frequently weigh against out-of-pocket costs. For example, trolling for that on-street parking spot makes more sense

BUILT AND NATURAL ENVIRONMENTS: A TECHNICAL REVIEW OF THE INTERACTIONS BETWEEN LAND USE, TRANSPORTATION, AND ENVIRONMENTAL QUALITY 22 (2001) (“[I]nduced travel can occur and can absorb all new capacity.”). *But cf.* TRANSPORTATION RESEARCH BD., *supra* note 117, at 163 (“[O]nly part of the increased highway use can be attributed to the highway capacity addition.”).

143. FHWA, U.S. DOT, *Induced Travel: Frequently Asked Questions*, <http://www.fhwa.dot.gov/planning/itfaq.htm#q5> (“Improvements in any transportation system can lead to changes in travel behavior that will result in increased use of the system. A new bus route, rail transit line or commuter rail service is typically developed with the expressed purpose of ‘attracting new riders.’”).
144. UTAH TRANSIT AUTHORITY, COMPREHENSIVE ANNUAL FINANCIAL REPORT FOR FISCAL YEAR ENDED DECEMBER 31, 2004, at 56 (2005).
145. 1,000 FRIENDS OF OREGON, *supra* note 117; Jan Hartman, *The Delft Bicycle Network*, in *THE GREENING OF URBAN TRANSPORT* (Rodney Tolley ed., Belhaven Press 1990).
146. DOWNS, *supra* note 4, at 86.
147. See Giuliano, *supra* note 136, at 240-41; Phil Goodwin et al., *Evidence on the Effects of Road Capacity Reduction on Traffic Levels*, <http://www.worldcarfree.net/resources/freesources/Evide.htm>.
148. See DOWNS, *supra* note 4, at 106.

149. See, e.g., Brian D. Taylor, *The Geography of Urban Transportation Finance*, in *THE GEOGRAPHY OF URBAN TRANSPORTATION*, *supra* note 7, at 294, 307 (indicating that more than 87% of government spending on transportation capital facilities in 2000 went to roads and highways).
150. See BRUCE KATZ & ROBERT PUENTES, *TAKING THE HIGH ROAD: A METROPOLITAN AGENDA FOR TRANSPORTATION REFORM 55* (2005) (indicating an approximate 300% increase in vehicle travel between 1960 and 2000, compared to a population increase of about 50%).
151. Hanson, *supra* note 7, at 4; Prevedouros & Schofer, *supra* note 21, at 49.
152. See Robert Cervero & John Landis, *Twenty Years of the Bay Area Rapid Transit System: Land Use and Development Impacts*, 31 *TRANSP. RES. PART A* 309 (1997) (demonstrating the influences of rail transit in encouraging dense, mixed-use development). See generally ROBERT CERVERO, *THE TRANSIT METROPOLIS: A GLOBAL INQUIRY* (1998).
153. Transportation is, in fact, a potential barrier to market entry and hence something that should be minimized to increase market efficiency. See, e.g., RICHARD HAACK ET AL., *THE SPLINTERED MARKET: BARRIERS TO INTERPROVINCIAL TRADE IN CANADIAN AGRICULTURE 1* (1981).
154. U.S. EPA, *supra* note 142, at 22 (“When cost goes down, demand goes up.”).
155. Tommy Gärling & Reginald G. Golledge, *Cognitive Mapping and Spatial Decision-Making*, in *COGNITIVE MAPPING: PAST, PRESENT, AND FUTURE 44*, 51 (Rob Kitchin & Scott Freundschuh eds., 2000); see TRANSPORTATION RESEARCH BD., *supra* note 117, at 142 (“All else being equal, the lower the cost of highway travel, the greater the propensity to travel and the less priority residents and businesses will give to transportation relative to other preferences and costs of doing business.”).

when there is plenty of time before the concert is scheduled to begin; when it is just prior to show time, the pay lot begins to look more attractive. Similarly, the relative proximity of the various parking options to the concert venue can play a role; at what point do the time and convenience costs of walking from an on-street spot several blocks away outweigh the money costs of the pay lot located across the street from the concert hall?

Additional factors add to the complexity. People will likely view the time/convenience costs higher if the concert program does not allow for late seating of audience members than for a night club where people can come and go at will. Concerns about personal and vehicle security might also change the balance. Finally, the amount of money available to the traveler can play a role; paying for parking feels better on pay day than the day before. To further complicate things, all of these balances change when we change the type of trip; the calculations one makes for a night on the town are very different from those made for the daily commute to work.

In addition to the type of cost (money, time, convenience), the way in which the cost is imposed can influence travel choices. There are two basic methods of cost imposition: fixed and incremental. Fixed costs are those that do not vary with the amount of use. One either pays the cost—thereby gaining access to a particular travel option—or does not—resulting in the foreclosure of that option. It is an all-or-nothing calculation. The amount that one uses or plans to use the travel option does not vary the cost. The cost is, hence, fixed.

The readiest example of a fixed cost is the capital cost of buying a car. The car's price is determined by a number of factors, including the costs of manufacturing, shipping, and marketing the car; the market demand for the car; the dealer's capital and operating expenses; the cost of borrowing money from the bank; and various taxes associated with car sales. The amount that the purchaser uses or plans to use the car has no bearing on the transaction. The car will cost as much if it sits in the driveway all the time as it will if the purchaser drives it 50,000 miles a year. Of course, the purchaser that drives her car 50,000 miles a year will need to buy another car sooner than the one that lets the car sit in the driveway, but at the moment of purchase the car costs the same for both purchasers. Examples of fixed costs from other transportation modes include bus passes and bicycles. As with cars, the cost of buying each of these goods is independent from the amount the goods are actually used.

The opposite is true of the other cost method—incremental. Incremental costs are those that do vary with the amount of use. With incremental costs, costs and use are proportional: the more you use, the more you pay. Here, the best example is bus fare. Every time someone boards the bus, they pay a fare (assuming they do not have a pass). If they ride more, they pay more; if they want to pay less, they need to ride less. Other examples of incremental costs include highway tolls, parking, and the exertion of pedaling a bicycle. Time and convenience costs are almost always incremental, as well: the time spent sitting in traffic congestion or trolling for an on-street parking spot are paid per instance.

This distinction between fixed and incremental costs is important because people tend to view them differently when making choices about travel. The basic rule is that people generally seek to maximize the use of fixed-cost

based transportation modes and minimize the use of incremental cost options.<sup>156</sup> From a personal utility perspective, this makes sense.<sup>157</sup> The fixed cost option is already paid for; using it more will not cost more.<sup>158</sup> In fact, increased use of a fixed-cost transportation option lowers the calculated amortized per use cost of that option, often to the point where continued use is perceived to be free.<sup>159</sup> In contrast, an incrementally charged option will, by definition, always cost more with additional use. Hence, travelers that have comparable fixed cost and incremental cost alternatives will most frequently choose the fixed cost option.<sup>160</sup>

One of the easiest ways to understand this relationship is to observe the use patterns of skiers. Skiers tend to ski more days in the years they have an annual pass than in the years when they pay for each visit individually.<sup>161</sup> Moreover, when they have an annual pass, they tend to use the resort that issued the pass to a much greater degree than other resorts where they have to pay per visit. Pass holders understandably want to maximize their investment in their pass and minimize the additional costs of skiing somewhere else.

The same relationships hold true for transportation, but of course the calculations are more complex. If the only factors used in making a choice were the fixed capital costs of purchasing a car versus the incremental costs of riding the bus (without a pass), then the car would win almost all of the time. There are, of course, more costs to driving and riding the bus than just the purchase of a car or bus fare.

A concept related to the fixed-incremental dichotomy is the impact on travel choice associated with the temporal relationship between when one makes a travel choice and when one has to pay for it. Generally speaking, the closer in time between travel choice and payment, the less likely one will choose that travel option. Travel alternatives in which choice and payment are coterminous have greatest opportunity for sending market signals to consumers about the costs of various options.<sup>162</sup> On the other hand, temporally sepa-

156. See John E. Evans IV et al., *Road Value Pricing*, in TRAVELER RESPONSE TO TRANSPORTATION SYSTEM CHANGES ch. 14, at 2 (Transportation Research Board 2004) (outlining the arguments in favor of incremental road pricing); see also Hal R. Arkes & Catherine Blumer, *The Psychology of Sunk Cost*, 35 ORGANIZATIONAL BEHAV. & HUM. DECISION PROCESSES 124, 124 (1985).

157. See HAROLD H. KASSARJIAN & THOMAS S. ROBERTSON, PERSPECTIVES IN CONSUMER BEHAVIOR xii (outlining the standard micro-economic theory that "[c]onsumers will behave in such a way as to maximize utility").

158. Elizabeth Shay & Asad J. Khattak, *Automobile Ownership and Use in Neotraditional and Conventional Neighborhoods*, 1902 TRANSP. RES. REC. 18 (2005) ("[V]ehicles generally are treated by their owners as sunk costs.").

159. See EDWARD BEIMBORN ET AL., INSIDE THE BLACKBOX: MAKING TRANSPORTATION MODELS WORK FOR LIVABLE COMMUNITIES 22 (Environmental Defense Fund n.d.), available at [http://www.environmentaldefense.org/documents/1859\\_InsideBlackBox.pdf](http://www.environmentaldefense.org/documents/1859_InsideBlackBox.pdf) (outlining why travel forecasting models exclude the fixed costs of vehicle ownership and maintenance from calculations to estimate the number of trips made by automobile versus the number made by transit).

160. See, e.g., Brian E. McCollom & Richard H. Pratt, *Transit Pricing and Fares*, in TRAVELER RESPONSE TO TRANSPORTATION SYSTEM CHANGES, *supra* note 156, ch. 12, at 24 (explaining how the introduction of unlimited use passes in New York resulted in a 6.6% increase in ridership).

161. Based on informal surveys of students at the University of Utah, 1999-2007.

162. See Drazen Prelec & Duncan Simester, *Always Leave Home Without It: A Further Investigation of the Credit-Card Effect on Willingness to Pay*, 12 MARKETING LETTERS 5 (2001) (outlining how willing-

rating payment from choice allows consumers to temporarily ignore the cost of their decisions.<sup>163</sup> In general, incremental costs tend to be charged simultaneously with travel choice—for example, paying bus fare—while fixed costs tend to separate payment and choice points—for example, buying a new car on credit, but there are many exceptions.

Car ownership and use involve a number of costs, some of which may be fixed, incremental, paid at the time of choice, or deferred. Purchasing a car is a fixed cost usually financed with deferred payments, as already outlined, but what about insurance? Most insurance companies base their rates, in part, on the amount of driving the insured plans on doing.<sup>164</sup> While this sounds like an incremental cost method, the mileage estimate is a projection made at the time of purchase, one that very few will revisit at the renewal of the contract period. Moreover, the transaction is made at a single point in time, temporarily separated from the daily travel choice process.<sup>165</sup> Generally, insurance is not paid on a usage basis at the time of use, the way paying for bus fare is.<sup>166</sup> In other words, insurance much more closely resembles a fixed cost than an incremental cost.

Fuel, on the other hand, more closely resembles an incremental cost. While most people do not pay for fuel each time they drive, purchasing fuel happens frequently enough that the choice to use a car and the need to buy fuel are fairly close in time. Moreover, the frequency of fuel purchases is directly tied to the amount of car use.<sup>167</sup>

Vehicle maintenance costs are somewhere in between. Certainly, higher rates of driving lead to more wear and tear on the vehicle, necessitating more regular maintenance. However, the points of payment for maintenance costs are not frequent and are generally removed in time from daily travel choice processes. Hence, maintenance costs act more like fixed costs in the way they influence travel decisions.<sup>168</sup>

On balance, most of the costs associated with car ownership and use are fixed and tend to be temporally removed from daily travel choices. Of the \$835 billion Americans spent on owning and operating private vehicles in 2001, 53% was spent on fixed costs—purchase price, financing, insurance, licensing, and registration—while only 20%

was spent on incremental costs—fuel and tolls.<sup>169</sup> Although some time and convenience costs associated with car use, such as those associated with traffic congestion, are paid incrementally, these are generally offset by the automobile's many time and convenience benefits, which also accrue incrementally.

By contrast, many of the costs associated with transit use are imposed incrementally. As mentioned, with the exception of monthly/yearly passes, fares are generally charged on a per use basis, which is by definition an incremental cost. In addition, transit travel tends to be significantly slower than automobile travel,<sup>170</sup> with much less geographic and temporal flexibility. These time and convenience costs are also paid incrementally.

In summary, the cost of travel substantially affects travel choices. The amount of travel consumed is partially a function of how much it costs: as price increases, travel decreases, and vice versa. The method used to impose travel costs is also important. Travel options that impose costs incrementally and require payment at the time of use tend to discourage use; conversely, those that charge through fixed cost methods and allow for deferral of payment tend to encourage use. Hence, a public policy that favors one mode of transportation over another would seek to charge the costs of the favored mode using a fixed cost method and charge the costs of the disfavored mode incrementally. Using this rubric, a casual observer would have to conclude that U.S. public policy either explicitly or implicitly favors driving: well over one-half of the costs of driving are paid through fixed-cost methods and are paid through deferred payment programs, whereas the costs of using non-automobile modes, in both out-of-pocket and time costs, are paid incrementally. Intentional or not, the current transportation pricing methods are substantially responsible for America's automobile dependency<sup>171</sup> and its resulting dispersal of destinations and decrease in accessibility. An access-efficient planning paradigm would seek to reverse those conditions by taking steps to have more of the costs of driving charged incrementally and more of the costs of using other modes charged through fixed-cost methods.

### C. Education

In addition to infrastructure and cost, education plays an important role in influencing travel choices. People will only select travel options from a set of choices they deem to be viable for meeting their needs.<sup>172</sup> The formation of that set is influenced by a number of factors, including the physical availability of options, cultural and familial influences, and lifestyle choices.<sup>173</sup> Also relevant is the amount and quality of information a user has about various travel options; one

ness-to-pay can be increased up to 100% when customers are instructed to use a credit card rather than cash); Dilip Soman, *Effects of Payment Mechanism on Spending Behavior: The Role of Rehearsal and Immediacy of Payments*, 27 J. CONSUMER RES. 460, 463 (2001) ("Payment by check . . . results in a tighter association of payments with individual transactions.").

163. See Soman, *supra* note 162, at 463 ("[P]ayments by credit card result in the disassociation of payments from benefits (due to a month-long payment cycle), which results in a weaker aversive impact.").

164. Insurance Information Institute, *Nine Ways to Lower Your Auto Insurance Costs*, [http://www.pueblo.gsa.gov/cic\\_text/cars/autoinsu/autoinsu.htm](http://www.pueblo.gsa.gov/cic_text/cars/autoinsu/autoinsu.htm).

165. People often pay for insurance in installments, e.g., monthly, but like with the purchase of a car, the features of the purchase agreement are set at a single point. The monthly payments merely fulfill the contract terms; they do not vary with the amount the consumer may have driven in the past month.

166. While most people pay for car insurance in a single transaction, there is some movement toward "pay-as-you-drive" options. See Victoria Transport Policy Institute, TDM Encyclopedia "Pay as You Drive Vehicle Insurance," <http://www.vtpi.org/tm/tm79.htm>.

167. This is why fuel costs are incorporated into travel forecasting methodologies used to estimate the amount of vehicle use. See BEIMBORN ET AL., *supra* note 159, at 22.

168. *Id.*

169. U.S. CENSUS BUREAU, STATISTICAL ABSTRACT OF THE UNITED STATES: 2006, at 694 (2005). The remaining 27% was spent on maintenance and parking. As outlined, maintenance has attributes of being both fixed and incremental. Parking could be either fixed or incremental depending on whether it is purchased through a permit (fixed) or by amount used (incremental).

170. See ALAN E. PISARSKI, COMMUTING IN AMERICA III: THE THIRD NATIONAL REPORT ON COMMUTING PATTERNS AND TRENDS 109 (2006) (average travel time by solo car commuters was 24.06 minutes in 2000, compared with 45.88 for bus commuters).

171. See DOWNS, *supra* note 4, at 42-48.

172. Zhang, *supra* note 119, at 56.

173. *Id.*

cannot choose an option that is fully or partially unknown.<sup>174</sup> It may be that the user has complete information about the choices available, and can therefore make a rational choice that maximizes personal utility. Incomplete information about travel choices, however, can result in an artificially restricted choice set, leading to a skewed choice process.<sup>175</sup>

How people learn about transportation systems is complex and difficult to untangle. An important component, however, involves cognitive mapping. Cognitive mapping refers to the process humans use to internally record and recall spatial information.<sup>176</sup> It is the way we find our way around our neighborhoods, cities, and regions. It is not an innate body of information, but is learned through observation and experience.<sup>177</sup> Hence, it is a dynamic type of learning, subject to revision and updating in response to new data.<sup>178</sup> For example, when we see that a building we have observed previously on a particular street has been demolished, we alter our internal map of that street to reflect the change.

There are two primary ways we understand our geographic environment: route-based knowledge and survey knowledge.<sup>179</sup> Route-based information is organized as a stepwise progression, from an origin to a destination, and is punctuated by a series of turns and alterations that are usually keyed off of specified landmarks. It is, in a sense, single dimensional in that it focuses only on the strip comprising the route itself; off-route information is incidental or irrelevant.<sup>180</sup> Survey information, by contrast, is a two dimensional type of spatial knowledge that provides a mental layout of an entire area.

Our initial learning of an environment, for example as a child, is most often accomplished through a route-based method.<sup>181</sup> We understand how to walk from home to school, but our knowledge of features one block off of our path is uncertain.<sup>182</sup> Gradually, as we accumulate knowledge about a series of overlaying routes, we piece together a mental layout of the neighborhood.<sup>183</sup> By the time we are young adults we usually have a pretty good sense of how our town is laid out.<sup>184</sup>

These distinctions are important in making transportation choices. In general, a survey or layout understanding of the environment facilitates self-propelled or self-controlled

modes of transportation. Certainly, there are times when we require route-based information—to find our way to a friend's house in an unfamiliar part of town, for example—but our general understanding of how a town is laid out makes it fairly easy to find our way when we drive, bicycle, or walk. If we have a general understanding of the two-dimensional layout, we can most often be confident that we will successfully find our way from origin to destination in one manner or another without getting lost.<sup>185</sup> On the other hand, the use of transportation modes that are not self-controlled, principally transit, depend on very specific route-based information. Each bus route or rail line has a detailed and sometimes serpentine path by which it courses through a community. In contrast to self-controlled modes, having a general knowledge of the town's layout is not sufficient to successfully arrive at an intended destination via transit; one must know the specific route that the train or bus will travel.

This information differential makes choosing transit particularly challenging. Not only must one know the layout of the town, one must also understand at least some subset of the route structure of one or more bus or rail lines. In addition to geographic information, one must also have a way to understand transit's temporal dimension. Although some transit routes have service frequencies that provide buses or trains so often that schedule information is not necessary, most routes are not served that regularly. Hence, having written or memorized information about service times and frequencies is usually required. This, too, is distinct from self-controlled transportation modes that are available at the whim of the user. Using transit usually requires having other information as well, such as how to pay, how much to pay, and when to pay.

When we find ourselves in places where we lack location information, i.e., where we have a hole in our cognitive map, we are, and feel, lost. This sense of disorientation makes us feel insecure about our surroundings and ourselves.<sup>186</sup> Naturally, we seek to minimize those kinds of experiences. One of the ways we do that is by going to places we already know—for which we already have a cognitive map.<sup>187</sup> In much the same way, we tend to stay with the transportation choices we know.<sup>188</sup> If there are holes in our understanding of how a particular transportation choice operates—for example, where a specific bus line goes or how often it operates—we will not include that option in our choice set.<sup>189</sup> If that option is not in our choice set, naturally, we will not choose it.

In modern American society, the general spatial education process outlined above is supplemented, nearly universally, by information about how to drive automobiles. From parental and societal conditioning, to blanket advertising in the media, to drivers' education courses in school, Americans are bombarded with information about how to use

174. Victoria Transport Policy Institute, TDM Encyclopedia, *Accessibility*, <http://www.vtpi.org/tdm/tdm84.htm> ("The mere existence of transport service may do little to improve accessibility if potential users do not know about it . . .").

175. See DEBORAH STONE, *POLICY PARADOX: THE ART OF POLITICAL DECISION MAKING* 71 (W.W. Norton 2002) ("A . . . condition for a well-functioning market is that there must be full information about the available alternatives . . .").

176. Reginald G. Golledge, *Human Wayfinding and Cognitive Maps, in WAYFINDING BEHAVIOR: COGNITIVE MAPPING AND OTHER SPATIAL PROCESSES* 5, 15 (John Hopkins Univ. Press 1999).

177. Gärling & Golledge, *supra* note 155, at 44.

178. Golledge, *supra* note 176, at 9.

179. *Id.*

180. Barbara Tversky, *Levels and Structure of Spatial Knowledge, in COGNITIVE MAPPING, supra* note 155, at 24, 36.

181. Patrick Péruch et al., *Understanding and Learning Virtual Spaces, in COGNITIVE MAPPING, supra* note 155, at 108, 110.

182. See Edward H. Cornell & C. Donald Heth, *Route Learning and Wayfinding, in COGNITIVE MAPPING, supra* note 155, at 66.

183. See David H. Uttal & Lisa S. Tan, *Cognitive Mapping in Childhood, in COGNITIVE MAPPING, supra* note 155, at 147, 150.

184. See KEVIN LYNCH, *GROWING UP IN CITIES* 28-48 (MIT Press 1977).

185. See Golledge, *supra* note 176, at 20 ("Wayfinding initially takes place when a route is not previously known even though an origin and/or destination are known.").

186. KEVIN LYNCH, *THE IMAGE OF THE CITY* 4-5 (1960).

187. See Golledge, *supra* note 176, at 26-29.

188. Zhang, *supra* note 119, at 59 ("Gradually, when driving becomes routine, the driver starts paying less attention to alternative forms of travel, thereby developing a travel habit that fosters automobile dependence.").

189. See Golledge, *supra* note 176, at 10 ("[S]omeone can become locally disoriented . . . , while still comprehending the basic structure of the larger environment through which travel is taking place.").

streets and highways to drive cars. Information about other travel choices is much harder to come by. Nevertheless, in those comparatively limited instances when marketing is attempted to promote non-automobile modes, it has been effective in changing travel patterns.<sup>190</sup>

The impact of education on travel choices demonstrates its importance in creating an access-efficient transportation system. Under such a system, travel options that promote exchange and minimize travel—non-automobile modes—would be marketed aggressively; driving, particularly solo driving, would be deemphasized or actively discouraged.

#### D. Land Use

The final policy influence on travel patterns is land use. The built environment through which a transportation system traverses can have a determinative effect in how people choose to travel.<sup>191</sup> Land use patterns can determine whether it is cost-effective to run a bus through a neighborhood, whether it is feasible to run mid-day errands without a car, and whether it is possible to safely and conveniently cross the street on foot. If transportation is about getting from here to there, land use defines the nature of *here* and *there* and in so doing establishes the range of transportation options that are feasible. For convenience, land use issues are frequently sub-categorized into three “Ds”: density; diversity; and design.<sup>192</sup>

##### 1. Density

Density is a representation of land use intensity. Either directly or indirectly, it measures the concentration of human activity. At a base level, density is important because it indicates how many potential travelers there are within a given geographic area. As outlined above, travel patterns are significantly influenced by a number of economic and demographic characteristics of persons and households. Density reflects just how many of those persons and households, and their associated travel patterns, are contained in particular place.

Density, however, has been shown to be much more important than just a sum of demographically related travel characteristics. For decades, studies have shown significant

correlations between density and various types of travel choice. Persons living in higher density neighborhoods tend to be less automobile dependent,<sup>193</sup> own fewer cars,<sup>194</sup> and drive them less often<sup>195</sup> and for shorter distances<sup>196</sup> than persons living in lower density neighborhoods. Conversely, denser neighborhoods are generally associated with higher use levels of non-automotive modes.<sup>197</sup> The relationship between density and travel patterns is sourced in accessibility. People living and working in denser neighborhoods usually have access to a much greater range of potential destinations within close proximity than those in lower density neighborhoods.<sup>198</sup> That increased accessibility makes lower rates of automobile use possible and use of alternative modes convenient, even preferable.<sup>199</sup> People in higher density neighborhoods are not staying home more than those in low-density neighborhoods; they make just about as many total trips as their low-density cousins, but they rely much more on non-automobile modes and they travel substantially fewer miles.<sup>200</sup> In other words, the high-density residents are achieving similar exchange levels as the low-density residents, but they are doing it with much less travel—the goal of access efficiency.

##### 2. Diversity

Diversity refers to the mix of land uses within a small geographic area. The focus is not just on the traditional broad categories of uses—residential, commercial, and industrial—but also on land use types within those categories. For example, the commercial component of a diverse environment might include small real estate offices, a large law firm, a couple of travel agencies, hair salons, tax accountant offices, health spas, music shops, a large department store, restaurants and cafes, and a book store. Suburban developments frequently have very little land use diversity; often they are comprised of a narrow range of land use types within a single category. Residential areas will not be just residential, but will frequently contain only a limited num-

193. Zhang, *supra* note 119, at 59.

194. Daniel Baldwin Hess & Paul M. Ong, *Traditional Neighborhoods and Automobile Ownership*, 1805 TRANSP. RES. REC. 35, 42 (2002).

195. PUSHKAREV & ZUPAN, *supra* note 4, at 29-35.

196. See NEWMAN & KENWORTHY, *supra* note 17, at 100-103; Reid Ewing, *Is Los Angeles-Style Sprawl Desirable?*, 63 J. AM. PLAN. ASS'N, 107, 113 (1997) (“By various estimates, doubling urban density results in a 25-30 percent reduction in VMT, or a slightly smaller reduction when the effects of other variables are controlled . . .”); Kuzmyak et al., *supra* note 192, at 13-23; Shay & Khattak, *supra* note 158, at 19.

197. See 1,000 FRIENDS OF OREGON, *supra* note 117, at 22; PUSHKAREV & ZUPAN, *supra* note 4, at 29-35; TRANSYSTEMS CORP., *supra* note 190, at 2-12 (“For bus routes, and indeed for transit in general, perhaps the most important single factor affecting ridership is the density of development in the corridor served by the route.”); Kuzmyak et al., *supra* note 192, at 30-35.

198. G. Scott Rutherford et al., *Travel Impacts of Urban Form: Implications From an Analysis of Two Seattle Area Travel Diaries*, in URBAN DESIGN, TELECOMMUTING AND TRAVEL FORECASTING CONFERENCE, WILLIAMSBURG, VIRGINIA: SUMMARY, RECOMMENDATIONS, AND COMPENDIUM OF PAPERS (L. Day ed., Texas Transportation Inst. 1997).

199. For example, consider the extreme case of mid-town Manhattan, one of the densest environments in the United States, where driving can result in inferior accessibility compared to other modes.

200. Robert T. Dunphy & Kimberly Fisher, *Transportation, Congestion, and Density: New Insights*, 1552 TRANSP. RES. REC. 89 (1996).

190. See, e.g., TRANSYSTEMS CORP., ELEMENTS NEEDED TO CREATE HIGH RIDERSHIP TRANSIT SYSTEMS: INTERIM GUIDEBOOK 2-3 (2005), available at [http://onlinepubs.trb.org/onlinepubs/tcrp/tcrp\\_webdoc\\_32.pdf](http://onlinepubs.trb.org/onlinepubs/tcrp/tcrp_webdoc_32.pdf); Katherine F. Turnbull & Richard H. Pratt, *Transit Information and Promotion*, in TRAVELER RESPONSE TO TRANSPORTATION SYSTEM CHANGES, *supra* note 156, ch. 11, at 14 (“It appears to be a fairly universal finding . . . that targeting information to specific market groups generates additional ridership.”); Edward P. Weber et al., *Understanding Urban Commuters: How Are Non-SOV Commuters Different From SOV Commuters?*, 54 TRANSP. Q. 105 (2000); Victoria Transport Policy Institute, TDM Encyclopedia, *Marketing*, <http://www.vtpi.org/tdm/tdm23.htm> (“Given adequate resources, marketing programs can often increase use of alternative modes by 10-25% and reduce automobile use by 5-15% . . .”).

191. See Downs, *supra* note 4, at 200 (“A principal cause of the massive amount of daily travel in nearly every U.S. metropolitan area is the low density of residential and other settlements there.”).

192. See, e.g., Robert Cervero & Kara Kockelman, *Travel Demand and the 3Ds: Density, Diversity, and Design*, 2 TRANSP. RES. D 199 (1997); J. Richard Kuzmyak et al., *Land Use and Site Design*, in TRAVELER RESPONSE TO TRANSPORTATION SYSTEM CHANGES, *supra* note 156, ch. 15, at 2.

ber of product types aimed at a rather narrow socio-economic market; for example, single-family detached houses within a set range of sizes and prices. By comparison, city or town centers may contain a wide variety of residential uses, e.g., single-family detached houses, rental apartments, condos, and assisted living buildings, mixed in with a host of office, retail, manufacturing, cultural, educational, and entertainment organizations and businesses.

As with density, the amount of diversity correlates with a range of variation in travel patterns. Generally speaking, as the amount of diversity increases, the amount of single-occupant automobile driving decreases and the use of other transportation modes increases. People living in more diverse neighborhoods tend to own fewer cars<sup>201</sup> and drive them less frequently<sup>202</sup> than those living in more homogeneous environments. Those who commute to work sites located in diverse neighborhoods are more likely to travel by non-automobile modes than those working in single-use locations.<sup>203</sup> The reason for these connections appears to be the same as that cited above with regard to density: having a wider choice of land uses in closer proximity means that it is more likely that daily trip destinations will be more accessible with less travel.<sup>204</sup> Although there is some overlap among the two concepts, the difference between density and diversity is one of degree. Density asks: How much stuff is there? Diversity asks: What kind of stuff is there?<sup>205</sup>

### 3. Design

Whereas both density and diversity are related to some sense of physical propinquity between potential trip origins and destinations, design is targeted at the specific ways in which origins and destinations are connected. The concept of design, in this context, refers to a wide array of small-scale features in the built environment that make travel by one mode or another relatively easy and convenient or cumbersome and problematic. For example, a landscape designed for the convenience of car drivers might include multi-lane arterials, few intersections, large blocks, and ample parking lots located in front of buildings.<sup>206</sup> Those same

features, however, would likely make pedestrian travel unpleasant, indirect, and perhaps unsafe. Pedestrians instead prefer narrow, slow-speed streets, frequent crosswalks, small blocks, ample sidewalks, street-fronting buildings, and various amenities that make walking pleasant, e.g., street trees, street furniture, and visually interesting building facades.<sup>207</sup> Logic suggests that such features—such as the presence or absence of a stairway to overcome a steep topographic feature—can either facilitate or confound certain travel options.<sup>208</sup> The connection that design has with transportation is both interesting and controversial. While the evidence is not conclusive, it appears that design influences how people choose to travel. Specifically, that people will respond, at some level, to the indicated transportation design preference in a way that is consistent with that preference, i.e., that travel choices will at least partially reflect the design of the environment. In short, people accessing environments with high-quality pedestrian features are more likely to travel by non-automobile modes than those accessing environments dominated by automobile design features.

The definition of what design features are important in determining mode orientation is not firmly set. Many studies focus on the layout of local streets. Generally, smaller blocks arranged in a rectilinear orientation with a high density of four-way intersections is thought to be more conducive to pedestrian and bicycle movement than large block patterns with irregularly shaped blocks and few intersections. The rationale is that when people are traveling under their own power they are much more sensitive to travel distance, in general, and out-of-direction travel, in particular.<sup>209</sup> A route that is more direct and, hence, shorter is more likely to induce someone to walk or bike than a route that is long and circuitous.<sup>210</sup> A study attempting to measure the impacts of street connectivity in combination with other pedestrian design attributes—sidewalk connectivity, frequency of street crossings, and topography—found that households located in neighborhoods with a high level of these attributes had 10% fewer vehicle miles traveled (VMT) than households in neighbor-

201. See Hess & Ong, *supra* note 194, at 41 (“Households in neighborhoods with mixed land use are 31 percentage points more likely to be without an automobile than households in homogeneous neighborhoods.”).

202. See Certero & Kockelman, *supra* note 192, at 218; Kara Maria Kockelman, *Travel Behavior as a Function of Accessibility, Land Use Mixing, and Land Use Balance—Evidence From the San Francisco Bay Area*, 1607 *TRANSP. RES. REC.* 116 (1997).

203. See CAMBRIDGE SYSTEMATICS, *THE EFFECTS OF LAND USE AND TRAVEL DEMAND MANAGEMENT STRATEGIES ON COMMUTING BEHAVIOR* (U.S. DOT, Travel Model Improvement Program 1994), quoted in Victoria Transport Policy Institute, *TDM Encyclopedia, Land Use Impacts on Transport*, <http://www.vtpi.org/tdm/tdm20.htm>; ROBERT CERTEIRO, *AMERICA'S SUBURBAN CENTERS* 165 (Unwin Hyman 1989) (“Among all the site variables examined, the degree of land use mixing appears to have the greatest influence on the modal choices of . . . workers.”).

204. See Michael J. Greenwald & Marlon G. Boarnet, *Built Environment as Determinant of Walking Behavior: Analyzing Nonwork Pedestrian Travel in Portland, Oregon*, 1780 *TRANSP. RES. REC.* 33, 41 (2001) (“[T]he most important determinant of walking behavior appears to be trip distances: shorter distances increase the likelihood of individual walking trips for nonwork activities.”).

205. Kuzmyak et al., *supra* note 192, at 93-94.

206. See, e.g., JAMES HOWARD KUNSTLER, *THE GEOGRAPHY OF NOWHERE* 115 (Touchstone 1993) (“The suburban streets of almost all

postwar housing developments were designed so that a car can comfortably maneuver at fifty miles per hour—no matter what the legal speed limit is.”); MICHAEL SOUTHWORTH & ERAN BEN-JOSEPH, *STREETS AND THE SHAPING OF TOWNS AND CITIES* 4 (McGraw-Hill 1997) (“Design of the residential street network is based on statistical information and research that is primarily oriented to facilitating vehicle movement on large-scale streets and highways.”); Kuzmyak et al., *supra* note 192, at 15-58.

207. See, e.g., BICYCLE FEDERATION OF AMERICA, *CREATING WALKABLE COMMUNITIES: A GUIDE FOR LOCAL GOVERNMENTS* (Mid-America Regional Council 1998); PETER CALTHORPE, *THE NEXT AMERICAN METROPOLIS: ECOLOGY, COMMUNITY, AND THE AMERICAN DREAM* 65, 95-103 (Princeton Architectural Press 1993); DAVID L. HARKEY & CHARLES V. ZEGEER, *PEDESTRIAN SAFETY GUIDE AND COUNTERMEASURE SELECTION SYSTEM* (U.S. DOT 2004); PROJECT FOR PUBLIC SPACES, *TRANSIT-FRIENDLY STREETS: DESIGN AND TRAFFIC MANAGEMENT STRATEGIES TO SUPPORT LIVABLE COMMUNITIES* (National Academy Press 1998).

208. See Allan B. Jacobs & Donald Appleyard, *Toward an Urban Design Manifesto*, 53 *J. AM. PLAN. ASS'N* 112, 119 (1987) (“It is not enough to have high densities and an integration of activities to have cities.”).

209. Greenwald & Boarnet, *supra* note 204, at 41.

210. Kuzmyak et al., *supra* note 192, at 93 (“If a destination is close enough, walking or bicycling in lieu of motorized travel becomes a viable option.”).

hoods with only average levels.<sup>211</sup> The location of parking at commercial buildings—in the front or side of the building versus in the back—also appears to be important in affecting travel choices.<sup>212</sup>

Identifying quantifiable travel responses with neighborhood-scale design elements is a relatively new research area,<sup>213</sup> and many methodological issues have yet to be resolved.<sup>214</sup> As a result, the degree of association between specific design elements, e.g., street furniture, sidewalk and intersection density, street widths, and variations in travel choice is not well defined, making a precise articulation of optimal design elements difficult. In the studies identified above, researchers were not able to discern whether the identified design features—street crossings, sidewalk networks, etc.—were solely responsible for the observed variations in travel patterns or partly responsible in combination with other, unidentified design elements, or whether the features acted merely as proxies for other characteristics.<sup>215</sup> The difficulty in quantifying the transportation impacts of precise design components reflects, in part, the nature of neighborhood design issues and a mismatch of scales of analysis: travel patterns are assessed at a regional scale, while neighborhood design issues are articulated and addressed in very specific and localized contexts that vary greatly from neighborhood to neighborhood. In one neighborhood, increasing pedestrian-friendly routes will require the construction of a new mid-block street crossing, in another, the widening of a sidewalk and the planting of street trees, in still another, the narrowing of travel lanes on an arterial. Moreover, most design components considered important to travel choice processes usually appear in groups

of attributes, not as single features,<sup>216</sup> suggesting the possibility of overlapping and synergistic relationships. Regardless of the difficulty of identifying a precise list of components, the evidence indicates that some combination of small scale design features is important in influencing transportation choice processes.<sup>217</sup>

Collectively, the three Ds of density, diversity, and design can be used to distinguish built environments that either facilitate or frustrate access to desired activities. These spatially based elements are at the root of access efficiency. If the point is to increase access while minimizing travel, then the nature of the spatial relationships between trip origins and destinations is fundamental. Hence, a transportation planning process aimed at improving access efficiency would seek to promote built environments where potential origins and destinations are within close proximity and conveniently connected to each other<sup>218</sup>; in other words, environments that are dense, diverse, and designed for non-automotive access.

### E. Cross-Over Effects

Naturally, any attempt at breaking complex interactions into component parts, while helpful for comprehension, is artificial. There are many ways in which the categories presented here overlap. For example, the effects of providing transportation infrastructure could be incorporated into the discussion of transportation costs: infrastructure that is more plentiful is usually less costly to use, both in terms of time and money, making it more attractive.

Similarly, there are many ways in which the three land use Ds overlap. It is frequently the case that dense environments are also diverse and pedestrian-designed. In fact, there is research suggesting that the perceived effects of land use density are really the result of other, related factors such as land use diversity, accessibility to opportunity sites, constricted parking supplies, and increased transit availability.<sup>219</sup> This has led some to refer to density as a proxy for these other values.<sup>220</sup> That is probably an overstatement: it is possible to

211. 1,000 FRIENDS OF OREGON, *supra* note 117, at 32 (the results came from a multiple regression analysis that controlled for a variety of household demographic variables, as well as land use density and job accessibility); see CAMBRIDGE SYSTEMATICS ET AL., SAN FRANCISCO TRAVEL DEMAND FORECASTING MODEL DEVELOPMENT: FINAL REPORT (San Francisco County Transportation Authority 2002); MICHAEL REPLOGLÉ, INTEGRATING PEDESTRIAN AND BICYCLE FACTORS INTO REGIONAL TRANSPORTATION PLANNING MODELS: SUMMARY OF STATE-OF-THE-ART AND SUGGESTED STEPS FORWARD (Environmental Defense Fund 1995). *But cf.* SUSAN HANDY, ROBERT C. PATERSON & KENT BUTLER, PLANNING FOR STREET CONNECTIVITY: GETTING FROM HERE TO THERE 16-17 (American Planning Ass'n 2003) (outlining controversy among studies, some showing that grid street patterns may increase trip making (including by car) while others showing gridded streets resulting in less driving).

212. See Certero & Kockelman, *supra* note 192, at 214 (“[S]omeone heading to a shop within their neighborhood is, on average, 56% more likely to drive alone if all buildings are surrounded by front- and side-lot parking vs. if all buildings have rear-lot parking.”); see also 1,000 FRIENDS OF OREGON, MAKING THE LAND USE, TRANSPORTATION, AIR QUALITY CONNECTION: BUILDING ORIENTATION (1994); ANNE VERNEZ MOUDON, EFFECTS OF SITE DESIGN ON PEDESTRIAN TRAVEL IN MIXED USE, MEDIUM-DENSITY ENVIRONMENTS (Washington State Transportation Center 1996).

213. Reid Ewing & Robert Certero, *Travel and the Built Environment—A Synthesis*, 1780 TRANSP. RES. REC. 87 (2001) (assessing the travel impacts of land use design is “the newest frontier in travel research”).

214. See generally BOARNET & CRANE, *supra* note 120.

215. See 1,000 FRIENDS OF OREGON, *supra* note 117, at 34 (the factors used in the study to assess pedestrian friendliness “do not represent a taxonomy of attributes which support pedestrian activity”); see also BOARNET & CRANE, *supra* note 120, at 109-11 (articulates the potential for “self-selection” bias, i.e., that pedestrian-designed neighborhoods tend to attract people who are predisposed to walk).

216. See, e.g., DAVID SUCHER, CITY COMFORTS 66-99 (2003) (outlining 37 neighborhood design strategies to increase pedestrian and transit travel).

217. TRANSPORTATION RESEARCH BD., DOES THE BUILT ENVIRONMENT INFLUENCE PHYSICAL ACTIVITY? EXAMINING THE EVIDENCE 158 (2005) (“[P]ositive perceptions about shade, scenery, traffic, people, safety, and walking incentive and comfort were positively correlated with numbers of walking trips to neighborhood commercial areas.”).

218. See ELIOT ALLEN & F. KAID BENFIELD, ENVIRONMENTAL CHARACTERISTICS OF SMART-GROWTH NEIGHBORHOODS 17 (National Resources Defense Council 2003), available at <http://www.nrdc.org/cities/smartGrowth/char/charnash.pdf> (found that a neighborhood in Tennessee with modestly higher density, mix and connectivity had 25% fewer per capita VMT than an otherwise comparable nearby neighborhood); Asad J. Khattak & Daniel Rodriguez, *Travel Behavior in Neo-Traditional Neighborhood Developments: A Case Study in USA*, 39 TRANSP. RES. A 481 (2005) (found that residents of a “New Urbanist” neighborhood in North Carolina generated 22.1% fewer automobile trips and made three times as many walking trips than residents of an otherwise similar neighborhood, even when controlling for demographic factors and preferences).

219. See Kockelman, *supra* note 202. *But see* PARSONS BRINCKERHOFF QUADE & DOUGLAS, TRANSIT AND URBAN FORM, PART III: A GUIDEBOOK FOR PRACTITIONERS 4 (National Academy Press 1996), available at [http://onlinepubs.trb.org/onlinepubs/tcrp/tcrp\\_rpt\\_16-3.pdf](http://onlinepubs.trb.org/onlinepubs/tcrp/tcrp_rpt_16-3.pdf) (“Density or compactness of employment and population is the single most important factor associated with transit use.”).

220. See, e.g., Kuzmyak et al., *supra* note 192, at 29.

have a mixed use land use pattern designed for pedestrian access that is also low density. Many historic New England towns might fit this description. Rather than reading density as a proxy for these other factors, perhaps it is more accurate to say that density is an important, but by itself insufficient, factor for substantially influencing travel choices.<sup>221</sup>

The overlap between density and other land use factors illustrates one of the basic assumptions behind access efficiency-based planning: policy integration. As is the case with most complex urban issues, single-faceted approaches to transportation-related issues are frequently ineffective. For example, mounting a policy initiative using only changes in infrastructure without addressing the other three policy factors—transportation costs, education, and land use patterns—would be less likely to result in significant changes in outcomes than an initiative that integrates all four influence areas. To illustrate, imagine constructing a high-capacity rail transit system into a low-density, single-use, automobile-oriented suburban environment with abundant free parking. Further imagine that the construction of the system was not attended by effective policy initiatives to alter the status quo transportation cost, information, and land use conditions in the environment where the new transit system would operate. Under these conditions, the costs for transit use would still be at a competitive disadvantage compared to the costs of driving; consumer education about the new transit system would still lag behind society-sourced information favoring car use; and the land use patterns would not be supportive of increased transit use. In short, the new system would not likely be very successful in affecting substantial changes to preexisting travel patterns. This, more or less, describes what occurred in the San Francisco and Atlanta regions with the construction of the Bay Area Rapid Transit (BART) and Metropolitan Atlanta Rapid Transit Authority (MARTA) rail systems in the 1960s and 1970s. Both systems experienced disappointing ridership levels for decades.<sup>222</sup> A more effective approach was taken by planners in the Washington, D.C., area, who developed and implemented transit-supportive land use plans in advance of the construction of the Metrorail system, a transit network with a similar scale and level of service as BART and MARTA and constructed at about the same time. That fact, plus a constrained parking supply in the D.C. core (which effectively increased the cost of driving), resulted in much higher levels of transit ridership.<sup>223</sup>

This illustration outlines what an access-efficient transportation planning process would set out to do. In promoting

increased access to exchanges while minimizing the need to travel, such a planning system would seek to: (1) identify transportation infrastructure investments that would reduce travel; (2) charge transportation costs so that travel options that improve access efficiency would be charged with a fixed-cost method and those that reduce efficiency would be charged in an incremental fashion; (3) overcome or counteract the societal and educational imbalances favoring car use; and (4) foster built environments where trip origins and destinations are within close proximity and conveniently connected to each other. How would one create a process to incorporate all of these elements? One method would be to engage in a type of planning known as scenario planning.

#### IV. Scenario Planning

In the past two decades, numerous cities and towns across the United States have engaged in some form of visioning process to chart a future for their communities. These vision quests have frequently used some form of scenario planning process to quantitatively evaluate impacts from several alternative land use and transportation investment and policy options, analyzing relative impacts on items ranging from the affordability of housing to water quality. Almost invariably, the analysis has included several measures of transportation efficiency.

##### A. Defining Scenario Planning

A scenario is “an internally consistent view of what the future might turn out to be—not a forecast, but one possible future outcome.”<sup>224</sup> Scenarios, fundamentally, are stories about the future. In fact, the use of *scenario* in the planning context is derived from the term’s use in Hollywood screenwriting.<sup>225</sup> Scenarios need not—and indeed, cannot—be unerringly predictive. Rather, their job is to present a vision of the future that is plausible in light of known information.

A process that uses scenarios to assess the future—a scenario planning process—utilizes a series of scenarios to gauge possible future conditions. The expectation is that through the process of conceiving, crafting, and evaluating a series of scenarios, an appropriate course, or series of courses, of action can be identified. Hence, through this process, the wide-open question of what the future might bring can be narrowed down to a more manageable set of possibilities.

The legacy of scenario planning is sourced in military history, dating at least as far back as sixth century BCE Chinese military practice.<sup>226</sup> During the 1960s and 1970s, strategic planners at several of the world’s largest corporations began using scenario planning to anticipate future market conditions and reduce business risk, particularly from external economic and environmental conditions. Perhaps the most famous business application from this period is the planning exercise mounted by Royal Dutch/Shell. Challenging the company’s single forecast assumption that global political

221. See PARSONS BRINCKERHOFF QUADE & DOUGLAS, *TRANSIT AND URBAN FORM, PART I: TRANSIT, URBAN FORM, AND THE BUILT ENVIRONMENT: A SUMMARY OF KNOWLEDGE 13* (National Academy Press 1996), available at [http://onlinepubs.trb.org/onlinepubs/tcrp/tcrp\\_rpt\\_16-1.pdf](http://onlinepubs.trb.org/onlinepubs/tcrp/tcrp_rpt_16-1.pdf) (“The effects of density are interrelated with employment center size, corridor level urban structure, transit service characteristics, and a variety of public policies (principally the supply and price of parking).”).

222. See Giuliano, *supra* note 136, at 264 (“[T]hese systems did not achieve expected ridership levels and failed to attract auto users to transit in significant numbers.”).

223. See *id.*; PARSONS BRINCKERHOFF QUADE & DOUGLAS, *TRANSIT, URBAN FORM, AND THE BUILT ENVIRONMENT: A SUMMARY OF KNOWLEDGE 8* (National Academy Press 1996), available at [http://onlinepubs.trb.org/onlinepubs/tcrp/tcrp\\_rpt\\_16-1.pdf](http://onlinepubs.trb.org/onlinepubs/tcrp/tcrp_rpt_16-1.pdf) (“[T]he integration of transit plans with local and community land use plans occurred in advance of the construction of Washington’s rapid rail system and has resulted in several notable success stories of station-area development” and higher levels of transit patronage.).

224. MICHAEL PORTER, *COMPETITIVE ADVANTAGE: CREATING AND SUSTAINING SUPERIOR PERFORMANCE* 446 (Free Press 1985).

225. MICHAEL GODET, *CREATING FUTURES: SCENARIO PLANNING AS A STRATEGIC MANAGEMENT TOOL* 74 (Economica 2001).

226. See LIONEL GILES, *SUN TZU ON THE ART OF WAR: THE OLDEST MILITARY TREATISE IN THE WORLD* (Project Gutenberg 1910).

and economic environments would remain stable, or would not affect the price of oil, planners created a set of scenarios that anticipated a range of political and market conditions. One of those scenarios essentially anticipated the conditions that occurred as a result of the oil embargo of 1973-1974. The planning exercise thus gave the company an ability to anticipate the embargo in a way that its competitors had not. It also substantially popularized scenario planning as a business planning technique.<sup>227</sup>

The current use of scenario planning techniques in land use transportation planning is derived partly from these military and business contexts, and partly from alternatives analysis requirements contained in the 3C planning process, noted above,<sup>228</sup> and the National Environmental Policy Act (NEPA).<sup>229</sup> During the 1970s and 1980s, these mandates fostered a style of transportation planning, still largely in use today, that is highly dependent on computerized modeling systems.<sup>230</sup> These now familiar systems take current trends, which are identified by the collection of survey data, to project into the future the possible operation of a proposed new system or facility. Among the system inputs is a series of socioeconomic data, including the expected location of future household and employment growth. In the traditional form of these planning processes, the allocation of those future land uses does not vary across alternatives. In other words, the future land use pattern is involved in the study process only as a single, specified input to the analysis, not as a variable or as a possible outcome. The possibility that differences in the land use pattern might affect the effectiveness and operation of the transportation system is not explored. The converse possibility—that the nature of the transportation system might influence the land use pattern—is also ignored.<sup>231</sup> In short, the process largely overlooks the influences transportation infrastructure has on development patterns and the land use 3Ds have on travel choices, as outlined in the previous section.

### *B. The Emergence of Land Use Transportation Scenario Planning*

The desire to overcome these limitations is at the root of an emerging trend to create an interactive land use transportation scenario planning process.<sup>232</sup> By incorporating approaches and techniques that capture or reflect the interactive nature of important causal relationships, these recent projects have essentially grafted the military/business approach to scenario planning onto NEPA-type alternatives

analysis, creating a new planning method. A 2004 survey of U.S. metropolitan areas indicated widespread and growing use of this planning approach over a short period of time, cataloging 80 projects in 48 metropolitan areas during a 15-year period.<sup>233</sup> Although details vary from project to project, the common features of these projects include the articulation of a baseline future trend scenario, the development of one or more alternative scenarios, quantitative assessments of the scenarios, and some comparison of the results.<sup>234</sup> A defining attribute of any scenario analysis is the creation of scenarios that integrate a variety of mutually consistent conditions and policies.<sup>235</sup> This feature makes the technique particularly apt for implementing an access-efficient style of transportation planning, and there have been several projects that have used the technique in that fashion.

One of the early leading examples in this vein was sponsored by 1000 Friends of Oregon, a nonprofit planning advocacy organization based in Portland, Oregon. The project, Making the Land Use, Transportation, Air Quality Connection (LUTRAQ), sought to articulate an integrated land use, transportation, demand-management alternative to a proposed new suburban freeway. The organization understood that the technical and political conditions giving rise to the freeway were based on a series of physical and economic assumptions about future growth in the freeway study area that indicated continued and expanding automobile-oriented development.<sup>236</sup> In response, the organization posited an alternative scenario that centered transit-oriented developments along two extensions of the region's transit network.<sup>237</sup> The scenario also incorporated a demand management system to provide free transit passes to commuters, while imposing parking fees on those driving to work alone.<sup>238</sup>

In this way, the LUTRAQ scenario directly incorporated three of the four policy factors outlined above. For transportation infrastructure, the scenario replaced the proposed freeway with two rail lines, plus a series of improvements to local streets and pedestrian and bicycle networks. For transportation costs, the scenario increased the cost for automobile-based commuting by charging, on an incremental basis, for parking that was formerly free. At the same time, the free transit pass made transit less expensive, and converted the normal transit fare from an incremental cost to a fixed one. Finally, the transit-oriented development land use assumptions placed moderately dense, mixed-use, pedestrian-designed developments in close proximity to the proposed expansions to the regional transit network.

227. GILL RINGLAND, *SCENARIO PLANNING: MANAGING FOR THE FUTURE* 19-21 (2d ed. 2006).

228. *See id.* at 15-18.

229. 42 U.S.C. §4332(2)(C).

230. *See generally* BEIMBORN, *supra* note 159.

231. *Id.* at 10-11.

232. *See* Keith Bartholomew, *A Tale of Two Cities*, 22 *TRANSP.* 273, 274-75 (1995).

233. Keith Bartholomew, *Land Use-Transportation Scenario Planning: Promise and Reality*, 34 *TRANSP.* (forthcoming July 2007), available at <http://www.springerlink.com/content/r20nt5g521n27854/?p=b7c4639a8c024dce9bea027eda637123&pi=0>; Keith Bartholomew, *Integrating Land Use Issues Into Transportation Planning: Scenario Planning* (annotated bibliography), <http://content.lib.utah.edu/cgi-bin/showfile.exe?CISOROOT=/ir-main&CISOPTR=101>.

234. Keith Bartholomew, *Land-Use Based Scenario Planning: Theory, Practice, Implications*, Paper presented at Transportation Research Board 2005 Annual Meeting, Washington, D.C. (January 10, 2005).

235. *See* PORTER, *supra* note 224, at 448.

236. 1,000 FRIENDS OF OREGON, *MAKING THE CONNECTIONS: A SUMMARY OF THE LUTRAQ PROJECT* 4-5 (1997).

237. *Id.* at 8-11.

238. *Id.* at 12.

**Table 1: Travel and Accessibility Comparisons From the LUTRAQ Project**

	No Build	Freeway	Freeway + Parking Pricing & Transit Passes	LUTRAQ
<b>Mode Choice</b> (home-based work trips)				
Walk/Bike	2.8	2.5	2.5	4.6
Drive Alone	75.8	75.1	61.7	57.5
Carpool	14	13.6	20.4	19.9
Transit	7.5	8.8	15.3	18
<b>Daily Vehicle Miles Traveled</b>	6,883,955	6,995,986	6,856,447	6,442,348
<b>Accessibility to Jobs and Shopping</b>				
% of Study Area w/i 30 Mins. of 500,000 Jobs	41.8	n/a	55.7	67.5
% of Study Area w/i 15 Mins. of 25,000 Retail Jobs	74.2	n/a	78.9	78.1

Source: 1000 Friends of Oregon, Making the Land Use, Transportation, Air Quality Connection: Analysis of Alternatives (1996).

When tested and compared with the freeway alternative, the LUTRAQ scenario showed significantly lower amounts of travel, but comparable or increased amounts of access. As outlined in Table 1, the LUTRAQ scenario indicated a 23% reduction in solo driving to work and a doubling of transit commuting, compared to the freeway scenario.<sup>239</sup> For overall travel, the LUTRAQ scenario resulted in 7.9% fewer VMT than the freeway.<sup>240</sup> The study's assessment of accessibility compared the LUTRAQ scenario with a version of the freeway scenario that also incorporated the parking pricing/free transit pass component. Even though that somewhat leveled the differences between scenarios, the LUTRAQ scenario had about the same amount of access to

shopping, and superior access to employment opportunities.<sup>241</sup> In short, the LUTRAQ scenario showed increased access to exchange opportunities, with reduced levels of travel. The study, thus, demonstrates at least one version of how a transportation planning process aimed at access efficiency might work.

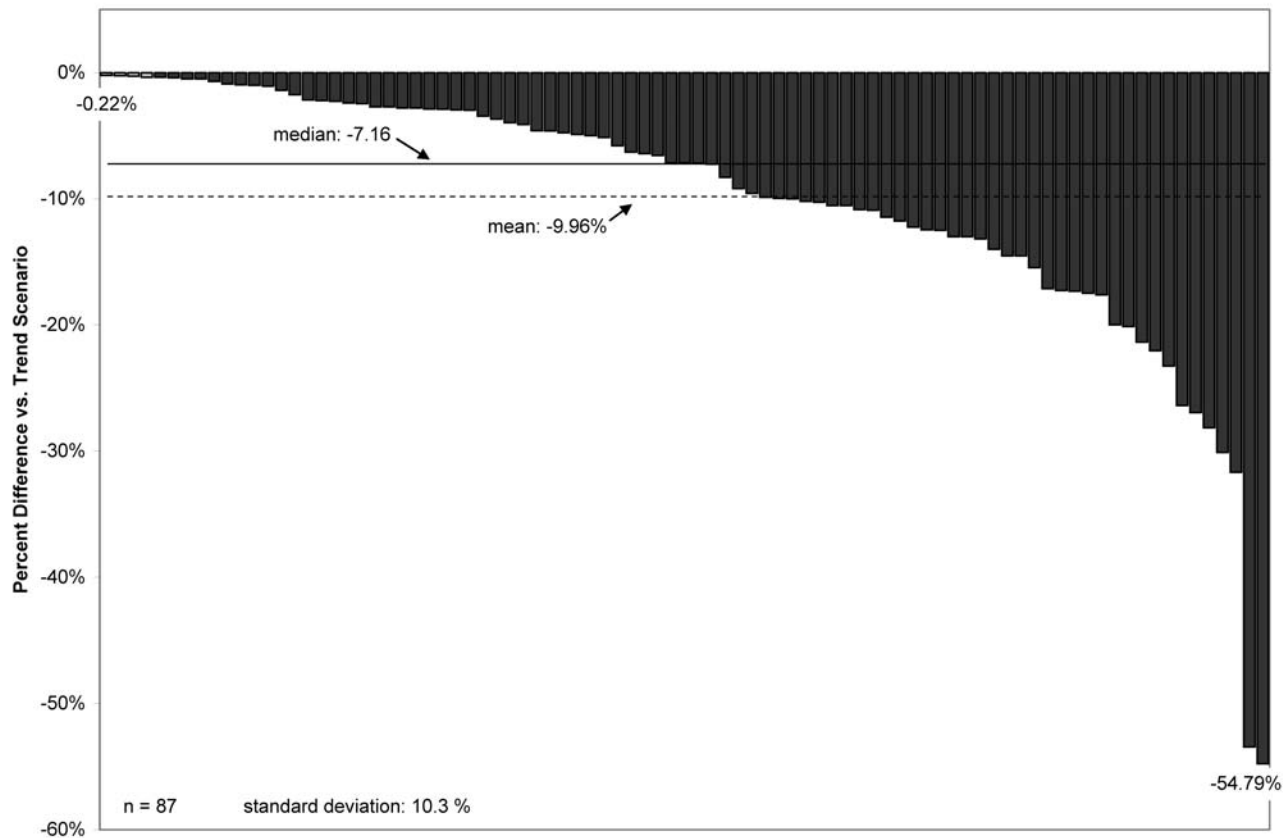
The LUTRAQ project's findings have been confirmed through a number of more recent projects. A group of 44 projects, selected from a database of land use transportation scenario planning project reports,<sup>242</sup> shows substantial reductions in overall travel compared to projected trend conditions.

239. 1,000 FRIENDS OF OREGON, MAKING THE LAND USE, TRANSPORTATION, AIR QUALITY CONNECTION: ANALYSIS OF ALTERNATIVES 15, 19 (1996), available at [http://www.friends.org/resources/lut\\_vol5.html](http://www.friends.org/resources/lut_vol5.html).

240. *Id.* at 24.

241. *Id.* at 22-23.

242. The projects were selected from a digital library of land use-transportation scenario planning projects maintained by the University of Utah. See University of Utah, *Digital Collections: Land Use Transportation Scenario Planning*, <http://www.lib.utah.edu/digital/collections/highways/>. The projects were included if: (1) they contained data on regional VMT; (2) they varied land use patterns to fit transportation elements; (3) they were at a regional geographic scale (as opposed to local or state); (4) they maintained consistent total population and employment totals across scenarios; and (5) the non-trend scenarios were denser than the trend scenario.

**Figure 1. Range of Variation in Vehicle Miles Traveled Compared to Trend Scenario**

As illustrated in Figure 1, the 87 scenarios contained in the selected projects demonstrate a range of reduction in overall travel of .22% to 54.79%, with a mean reduction of 9.96%. The wide range in variation is likely due to several factors, including the rate of population and employment growth in the study area (a higher growth rate likely leads to a higher VMT reduction), the length of time used for the planning horizon (the longer the horizon the higher the VMT reduction), and the type and degree of policies incorporated in the scenario. On this latter issue, all of the scenarios incorporated at least some variation in land use density (compared to the trend scenario), but the amount of deviation varied widely across scenarios. In addition to density, some scenarios included variations in one or more of the following components: land use diversity, land use design, pricing policies, and transportation infrastructure. The documentation on these projects does not contain direct information about accessibility. However, it is assumed that the persons whose travel patterns are being forecasted in these projects are accomplishing the normal tasks necessary for a full life; they are just doing it with less travel, compared to trend conditions. They are, in short, enjoying a built environment that is more access efficient.

## V. Conclusion

Cities are places for exchange. They provide the stage for human interactions of all kinds, from the mundane to the

profound. These exchanges create the basis for meaning and form the foundation of culture. Given the centrality of these functions to human existence, seeking systems that support and nurture exchanges by facilitating their occurrence with minimal cost and effort would seem paramount. Yet, regional transportation planning has seemingly had an opposite objective. By myopically focusing on mobility, our metropolitan transportation planning efforts have fostered dispersion of exchange locations, increasing the amount of travel needed to access them. This has frequently resulted in overall decreases in accessibility to places of exchange, particularly for those in our society without ready access to an automobile.

If transportation systems and the communities that are both served and affected by those systems are to be fully integrated in a planning process, the focus must shift from mobility to accessibility. Focusing on accessibility requires incorporating a series of interlocking policy, economic, and physical environmental factors into a multifaceted, integrative planning and decisionmaking process that addresses four primary areas: transportation infrastructure investment policy; the pricing of transportation infrastructure and services; education and social marketing on transportation issues; and land use intensity, heterogeneity, and design. The process must also incorporate robust and interactive public engagement. Scenario planning techniques hold the promise of providing a framework where these aims can be explored and optimized.

The development of a new transportation system planning paradigm in federal law seems crucial to the propagation of these techniques. However, neither SAFETEA-LU nor its implementing regulations facilitate the access efficiency analyses outlined here. Although metropolitan regions are free to engage in such analyses on their own, current federal law does not readily provide integration of such local efforts with federal mandates. This fact is born out by the very low number of scenario planning projects that have resulted in final decisions and implementing actions: more than 60% of reported scenario planning projects ended without the identification of a final preferred scenario and more than 25% of projects provided no evidence of subsequent implementing actions.<sup>243</sup> Had a more accommodating federal planning regime existed, it is reasonable to assume that a much higher rate of project completion

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243. Bartholomew, *supra* note 234, at 12.

and implementation would have been achieved. More importantly, the presence of federal planning regulations that facilitate and encourage, if not require, an accessibility-based scenario planning process would likely result in accelerating the already rapid growth of scenario planning in U.S. metropolitan areas.

At the time of this writing, SAFETEA-LU is less than two years old. However, it is only slightly more than two years before the law expires. Congressional committees are already starting the process of studying policy options for the next bill.<sup>244</sup> The new bill should redirect transportation planning requirements to encourage, reward, perhaps require, an access-efficient orientation. Such an overhaul is essential if we are to balance the machine, the garden, and the city.

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244. *See, e.g.*, House Comm. on Transportation and Infrastructure, *Oversight Plan for the 110th Congress*, Feb. 7, 2007, <http://transportation.house.gov/about/>.