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## **THE DISCREPANCY BETWEEN LIGHT RAIL FORECASTS AND ACTUAL RIDERSHIP: SLOPPY SCIENCE OR OUTRIGHT LIES?**

Transportation planners continually find themselves in search of alternative policy solutions to the problems caused by traffic congestion. Traditional solutions have involved the allocation of increasing shares of public funds toward expanding road and highway capacity. Many transportation planners now see the coordinated implementation of mass transit systems, particularly light rail lines, as the key to solving not only congestion problems, but also a variety of other urban issues including deteriorating inner city neighborhoods and declining air quality.<sup>1</sup> In order to convince public officials and communities that light rail systems are worth the cost, advocates use transportation models to generate ridership forecasts along proposed lines. Frequently, though, forecasts are wildly inaccurate, calling into question the motives of the forecasters and the methodology behind the science.

This report presents a framework for evaluating transit demand forecasts commonly used for projecting ridership along proposed light rail lines. Part I examines the methodologies by which forecasting models are designed and administered. Also summarized is the rationale for using transportation models to generate transit forecasts. Part II outlines some of the criticisms levied against transit demand forecasts and the transportation officials who use them to justify light rail construction. Finally, several possible reasons as to why light rail ridership forecasts have proven imprecise are identified.

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<sup>1</sup> Indeed, many champions of light rail are advocates not for perceived improvements in metropolitan transportation systems, but rather for improvements in air quality, expected economic development that traditionally follow light rail construction, or any number of other anticipated benefits. *See generally* SCOTT JOHNSON, "AUSTIN LOOKS TO IMPROVE ITS AIR QUALITY," LIGHT RAIL NEWS, AUSTIN AMERICAN-STATESMAN (May 30, 2000) *as a prime example*.

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## PART I

### *Design and Utilization of Transportation Models*

In order to understand how actual light rail ridership figures can vary widely from initial forecasts, the methodology used to create the transportation models must first be understood. One of the first computer-aided models was the Urban Transportation Modeling System (UTMS). The UTMS involves of a sequence of models that generate a simulation of flows on varying routes and transportation modes at different times of the day, week, or year. Though they can reasonably forecast short-term demands for transit, they tend to do worse at predicting long-term requirements. The primary reason is that UTMS models cannot predict land-use and travel patterns in a polycentric city.<sup>2</sup> Furthermore, they are designed to operate under the assumption that light rail lines will have no effect on future land-use patterns. This may work well for a short period of time, but breaks down over the long term.<sup>3</sup>

More sophisticated versions of transportation models can yield more than a general description of the effects of changes in transportation system characteristics.<sup>4</sup> They produce detailed reports of changes in traffic flows by route and mode. To isolate differences that are generated by the new mass transit system, they can require that all conditions not directly attributable to the system be held constant.<sup>5</sup> This applies to the entire policy setting within which all alternatives are evaluated: fare level and structure, levels of service provided by the transit system, parking policies, and future development

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<sup>2</sup> See generally JOEL GARREAU, *EDGE CITY: LIFE ON THE NEW FRONTIER* (1991) for a description of polycentric cities. (There are likely no longer any monocentric cities located within the United States, at least of a size amenable to supporting light rail.)

<sup>3</sup> Moore, Terry and Paul Thorsnes, *The Transportation/Land Use Connection*, American Planning Association, Planning Advisory Service Report Number 448/449, p. 34-35.

<sup>4</sup> A number of sophisticated transportation models exist. Two examples include: SUMMIT, a model developed for proposed transportation improvements along the Downtown/Natomas/Airport Corridor in Sacramento, California, and EMME/2, designed for generating ridership forecasts in the Puget Sound Region in the State of Washington.

<sup>5</sup> Moore, *supra* note 3.

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assumptions.<sup>6</sup> Given such a model, planners can simulate various effects and estimate the benefits to those who use the proposed light rail line. These models, therefore, provide tangible ridership forecasts as well as other relative values of proposed light rail projects.

### *Rationale for Using Transportation Models for Forecasting*

There are a number of reasons for using transportation models to forecast travel demand on proposed light rail lines. Light rail ridership forecasts generated by computer-aided transportation models help system designers and public officials make knowledgeable decisions about services and subsidies. Urban transportation planners, systems evaluators, and facilities designers depend on transportation models to determine transit vehicle requirements, various design considerations, and operating and maintenance costs.<sup>7,8</sup> Public officials rely upon transit forecasts to determine whether or not state and federal resources will be allocated for specific light rail projects or other mass transit programs.

Computer-aided modeling is also capable of manipulating data and other inputs to test various land use scenarios.<sup>9</sup> Modelers often need to make changes to model inputs to reflect anticipated conditions being studied. They must frequently deal with changes to land use characteristics that differ significantly from the adopted small area forecasts and the methodology used to process the outputs from the model into future ridership forecasts. Furthermore, models can be used to compare transportation alternatives to

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<sup>6</sup> See “Travel Demand Forecasting, Service and Patronage Impact Assessment Methodology Report,” prepared for the Sacramento Regional Transit District by DKS under subcontract to Parsons Brinckerhoff Quade & Douglas, Inc. April 15, 2002, p. 3.

<sup>7</sup> Transit patronage forecasts also serve as input to the environmental impact assessment analysis.

<sup>8</sup> See Travel Demand Model Review and Concurrence Policy for Pike’s Peak Area Council of Governments (PPACG), available on-line at [ppacg.org/concurrence.htm](http://ppacg.org/concurrence.htm).

<sup>9</sup> Waddell, Paul et al., *Land Use and Travel Demand Forecasting Models: Recommendations for Integrated Land Use and Travel Models*, Cambridge Systematics, Inc., prepared for Puget Sound Regional Council, June 30, 2001.

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determine the potential merits of a new light rail line as opposed to lower cost alternatives.

Finally, transportation models ensure predictability and transparency when forecasting future transit demand. A transparent model ensures that there are few surprises in the process of developing sound forecasts. At a minimum, computer models provide the appearance of rigorous and reliable analyses the public expects. For these reasons, modelers attempt to provide the most reliable and accurate forecasting information available.<sup>10</sup>

## PART II

### *Criticisms levied against travel demand forecasts*

Critics of light rail and other mass transportation systems have conducted studies analyzing the accuracy of transit demand forecasts. The Transportation Systems Center at the U.S. Department of Transportation prepared a widely noted study on the accuracy of the forecasts used to justify the construction of rail mass transit systems. The principal author, Don H. Pickrell, compared ridership estimates made for various light rail projects at the time the transit improvement projects were approved with actual ridership figures obtained after the system opened. Among his findings was the fact that light rail ridership averaged 65 percent below initial forecasts.<sup>11,12</sup>

Some critics accuse transit officials of using nefarious tactics to sell light rail to voters. One of those critics is John Kain, a Professor of Economics at Harvard University. In a report released in 1988, Kain accused Dallas transit officials of attempting to conceal

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<sup>10</sup> PPACG, *supra* 8.

<sup>11</sup> Transportation Systems Center, "Urban Rail Transit Projects: Forecast versus Actual Ridership and Costs." Cambridge, MA, U.S. Department of Transportation, October 1989 (PB90-148693).

<sup>12</sup> The American Public Transit Association has issued a response to Pickrell's paper. It includes two main objections, the primary argument being that ridership estimates were more accurate than those cited by Pickrell. *American Public Transit Association*, "Off Track," Washington, D.C. 1990.

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from the public travel forecasts that were unfavorable to the light rail system.<sup>13</sup> Another critic, Jonathan Richmond, accused transportation officials of blatant deception in order to gain approval for rail lines. In 1998, Richmond issued a report accusing transit managers of intentionally producing high initial ridership forecasts to sell a system to decision-makers. Later, as the actual opening date of the project approached, they issued new, lower figures against which the project would appear successful. He cited Los Angeles as an example, where an artificially low forecast of 10,000 daily weekday riders—one tenth of the original forecast for the mature system—was made for opening operations on the Green Line. According to Richmond, this enabled the transportation chair to announce one year following the inauguration of the line that the figure of 15,000 daily weekday riders had achieved more than was projected.<sup>14</sup>

#### *Justifications for Inaccurate Transit Demand Forecasts*

A number of reasons exist as to why initial light rail forecasts might vary from actual ridership figures. Light rail demand analyses require the use of a regional travel demand model that encompasses the appropriate level of detail and incorporates reliable performance measures. These include service levels, line patronage, station boarding by mode of access, transfers, and zone-to-zone travel times. Models must also represent entire transportation systems, including roadways as well as transit and pedestrian networks, as accurately as possible.<sup>15</sup> Because of the notable lag time between the transit demand forecasting process and the actual opening of the light rail line, an interval that can sometimes span a decade, it is infeasible for modelers to exactly foretell all transportation changes that will have occurred during the period. For this reason, modelers are required to envision the most likely future land use and transportation scenarios. The difference between those expectations and future realities can mean the

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<sup>13</sup> See Kain, John F. "Choosing the Wrong Technology: Or How to Spend Billions and Reduce Transit Use," *Journal of Advanced Transportation*, Vol. 21, Winter 1988, p. 202.

<sup>14</sup> Richmond, Jonathan, "Transitory Dreams: How New Rail Lines Often Hurt Transit Systems." The Taubman Center Report, Taubman Center for State and Local Government, John F. Kennedy School of Government, Harvard University, 1998, p. 1.

<sup>15</sup> Moore *supra* 3, at 1.

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difference between a reasonably accurate forecast and an estimate that misses the mark by several magnitudes.

Other factors that can have a detrimental effect on the accuracy of forecasts include shifts in demographic, economic, or political conditions within metropolitan regions.

Population and employment growth, trip generation costs, and the linkages between origins and destinations of trips all influence travel demand by all transportation modes and for all trip purposes.<sup>16</sup> Sufficient feeder bus access to rail stations, adequate nearby park and ride spaces, and an ample number of residents within walking distance of stations must be in place for rail systems to realize their ultimate capacity.<sup>17</sup> Moreover, policy decisions made by a variety of local and state agencies can influence light rail ridership. These include land use and development policies, parking policies, and transit-funding policies that are shaped by elected officials and their appointees.<sup>18</sup> Any change in these factors can have drastic effects upon light rail ridership.

### *Conclusions*

Early ridership forecasts for new transit facilities focus largely on the number of riders expected on the facilities themselves, often to the exclusion of any other information available from the forecasts. This has had unfortunate consequences on the reliability of the forecasts, and for the general level of understanding of the role of new transit facilities in promoting mobility within urban areas. The development of ridership forecasts requires the estimation of a large amount of supporting information that is of potential interest to a variety of audiences. These include changes in population and employment in various subareas, increasing congestion levels, travel-time savings available from new light rail lines, and light rail's share of various markets. Reviews of

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<sup>16</sup> *Ibid.*, at 4.

<sup>17</sup> See "Comparison of Link Light Rail versus Bus Rapid Transit Trunk Line Capacity," by R.C. Harkness Ph.D., a whitepaper prepared for Sound Transit, March 11, 2003, at 9.

<sup>18</sup> Moore *supra* 3, at 3.

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this information can be crucial in isolating problems in initial forecasts and increasing the credibility of the final results.

Changes in the political structure of a region can be equally detrimental to light rail ridership. Those in power who have an interest in seeing mass transit systems fail have a wide array of tools at their disposal. Indeed, in the Twin Cities metropolitan area, the recently elected Republican Governor Tim Pawlenty and his administration has already made assaults on the proposed operating budget of a new light rail line under construction in the City of Minneapolis.<sup>19</sup> In this instance, ridership is certain to lag due to probable decreases in service. The end result is that actual light rail ridership will be underwhelming when compared to the forecasted transit demand. For these and many other reasons, light rail ridership forecasts that prove inaccurate can be universally blamed neither on deceitful transit planners nor on sloppy science.

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<sup>19</sup> "We're asking that local municipalities -- Hennepin County and Minneapolis principally, that will be the primary beneficiaries of light rail -- that they pay 60 percent of the operating costs of light rail system. The state of Minnesota would pick up the remaining 40 percent. We think this is reasonable, particularly in light of the state contribution to the capital cost of the system. We put more than \$120 million into capital costs." -- Peter Bell, appointed by Gov. Tim Pawlenty as the new chair of the Metropolitan Council, as quoted by Minnesota Public Radio, February 20, 2003.