HIGHWAY STUDIES RELEVANT TO ANALYSIS OF RAPID TRANSIT

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Rail transit and highway transportation have fairly obvious differences. They also have similarities, and we may consider whether certain studies that have been made of highway facilities are relevant to analyzing the effects of transit systems.

Some studies supported by highway agencies are clearly relevant to analyzing such facilities as the Bay Area Rapid Transit system. These are the urban transportation studies that pay close attention to such matters as land use, trip generation, and choice of mode and route. Land use studies, for example, can be useful, especially for the before phase of a study. Relevant information and forecasts are available from several studies and agencies in the Bay Area, including the Bay Area Transportation Study (BATS), the Bay Area Simulation Study (BASS), the Projective Land Use Model (PLUM), and the West Bay Rapid Transit Authority. Those analyzing rapid transit systems may also want to peruse the reports that the U. S. Department of Transportation submits to the Congress each year dealing with fringe parking, relocation assistance, and the Traffic Operations Program to Improve Capacity and Safety (TOPICS). Fringe parking typically involves bus or rail transportation, and this may also be the case with TOPICS. Relocation provisions of the highway program seem relevant because people displaced by public programs in the future may receive assistance comparable to that established under the 1968 Federal-Aid Highway Act.

In addition to these continuing studies and programs, certain highway impact studies completed or under way may be able to provide some insight for the analysis of BART. These include studies with methodologies potentially adaptable to analyzing rail transit and studies involving a highway transportation service or effect somewhat like that of rail transit. A few generalizations are offered about highway impact studies in the hope that these may be helpful in planning studies of BART or other transit systems.

STUDY METHODOLOGIES ADAPTABLE FOR TRANSIT ANALYSIS

Study methods used in highway impact studies range from fairly simple studies of public attitudes and land values to studies using mathematical models to simulate the relevant transportation or economic sector. Fairly simple, short-term studies costing $25,000 or less have been fairly common in the 250 impact studies sponsored by highway agencies over the past 12 years or so. These studies often had fairly simple goals, for example, to learn the economic effects of one-way streets or median strips and the effect highways have on tax rolls, shopping patterns, and public services. Most of these studies provide no help for a comprehensive analysis of BART; however, a few are mentioned here in case they may be useful to students or others with limited research funds who may sometime be interested in studying some aspect of BART.

Studies of highway impact have typically involved analysis of such matters as land use, employment accessibility, educational opportunities, and accessibility to cultural and recreational activities. These are also being analyzed in a study of the Washington Metro System (1). One of the most successful studies of highway impact involved comparisons of land value, land use, population, and economic development in a study town and in 4 control towns about 4 years before and 4 years after highway construction. Towns typically differ in character and individually are not suitable as controls. Analysis of towns both separately and compositely, however, can reveal whether changes occurring in the study town are attributable to the highway. In this case, one of the primary study areas was a small town whose access time to downtown Dallas, 15 miles away, had been reduced from 30 to 17 minutes by completion of a limited-access radial highway (2). The study and control town approach provided specific information about dramatic economic growth in the study town; the analysts at Texas A&M University

involved in the study ascribed these to the highway. Comparison of study and control towns is apparently also being considered as a technique in the analysis of the effects of BART; for this analysis, it may be useful to combine control towns in order to de-emphasize individual differences between study and control towns.

Another highway study technique that may be useful in the analysis of the community effects of BART involves examination of the growth rates of selected geographic areas relative to the development of the entire area. For areas (or properties) examined, participation ratios can be developed. These ratios show whether an area's economic development is faster or slower than that of the region where it is located. Participation ratios based on the combined values of land and improvements can be used to compare economic development near a transportation facility with that for the whole region or with selected areas removed from the facility's influence. A closely related technique now being used involves analysis of an area's share of regional population and employment (3). The participation ratio approach was used by researchers at the University of Minnesota (4) and at the George Washington University (5) where good use was made of existing information, i.e., assessed values related to actual values by some sales of property. Participation ratios also lend themselves to analysis of economic development in fairly large regions, for example, a standard metropolitan statistical area or an even larger region.

Another device used in the past to learn whether a highway is associated with economic development, particularly central business uses, involves comparison of building heights and land area. This device is the Vance-Murphy technique and was developed at Clark University (6). This approach has been used to discern highway influence on downtown areas in Richmond, Virginia, and Long Beach and Oakland, California. It appears to be appropriate in central business districts or other intensely developed areas. A limitation on height of buildings around transit stations or in central business districts should not seriously affect this approach because type of development (e.g., retail, service, or residential) and amount of development are involved.

Studies of market penetration and participation of people in various activities can help show the effects of an improvement in transportation. Analyses of church and club participation, medical and educational services, and recreation show that improved highways tend to be associated with facilities for these types of activities that are more concentrated and spaced further apart (7, 8, 9). These types of investigations lend themselves to simple, inexpensive investigations using secondary data. For example, zip codes for patients or members of an organization before and after an improvement in transportation can provide insight concerning the facility's effect on an organization's geographic penetration. Additional studies, now under way or recently completed, that seem relevant include the nationwide study of highway needs, sociological and environmental studies concerned with matters such as noise, neighborhood boundaries, and disruptions, transportation needs of the elderly, handicapped, and the poor, and a classification of urban areas depending on their orientation to automobiles or transit.

HIGHWAY TRANSPORTATION SERVICE RESEMBLING TRANSIT SERVICE

Certain types of highways or highway service and effects appear to resemble those associated with transit and may be of interest because of this resemblance. Among these are radial highways providing access to downtown areas, highway bridges or other connections across water, and highway interchange areas.

Transportation facilities such as radial highways that improve mobility between central places and outlying areas have effects that are complex and difficult to understand fully, even after they occur. Some land economists contend that improved transportation, by reducing friction between places, reduces aggregate land rentals (and land values), other things remaining the same (9, 10, 11, 12). Wendt agrees that improvements in transportation add to the competitive supply of land but points out that the increase in population served by the improvement in transportation will increase the demand for urban land. Highway study findings support this view. For example, the North Central Expressway from Dallas to Richardson, Texas, 15 miles from downtown Dallas, was accompanied by an increase in the price of vacant land in both Dallas

and Richardson. Land values, in constant dollars, increased nearly 200 percent in Dallas and 500 percent in Richardson during the 8-year study period. Land in Richardson became much more competitive with land in downtown Dallas (2).

Bridges or other transportation facilities across rivers or other water sometimes result in dramatic changes in the areas affected. The fast economic gains associated with the Lake Washington Floating Bridge near Seattle and the Verrazano Bridge in New Jersey appear to be typical of what can result from substantial improvements in mobility between areas formerly separated by water.

Highway interchange areas and areas without direct access to the highway may also provide experience relevant to analyzing transit impact and land use needs around transit stations. Highway interchange areas near population centers typically attract so many activities that the interchange becomes congested. The problems at highway interchanges are by no means solved. However, there is already some interesting experience and a number of proposals available dealing with matters such as (a) parking areas near interchanges, (b) priorities for competing land uses depending on whether these are oriented more to the traveler or to the community, (c) arrangement of land uses depending on whether they serve inbound or outbound travelers, and (d) development in the interchange area and whether it should be guided and controlled by the local unit of government that may be concerned largely with growth of local tax rolls or a higher level of government responsible for rebuilding interchanges that become overcongested (13, 14, 15, 16). Fortunately, it appears that land planning around BART stations will eliminate many of the problems highway interchange areas have experienced with uncontrolled development and traffic congestion. There are, of course, differences as well as similarities between highway interchange areas and transit stations. Downs observes that development pressures are more concentrated but fall away faster at transit stations than at highway interchange areas. Also, transit stations and lines, at least subway lines, tend to be more compatible with residential development than highways are (17).

Experience in areas apparently cut off from highway access may also be relevant. Because of opportunities for visual exposure, areas located near limited-access highways but without direct access to the highway have attracted considerable activity. Land parcels within view of heavily traveled urban highways have even been valued highly in some cases where the parcel had no access to any public road; curiously, the market for such properties is not limited to abutting owners.

In addition to visual exposure of on-site facilities, billboard advertising could evolve along above-ground transit lines. Control of advertising along transit lines should be simpler than that along highways because questions of user needs would be absent. It seems doubtful that highway experience concerning techniques, attitudes, costs, affected groups, and efforts would have much relevance for transit advertising.

SOME FINDINGS AND INFERENCES FROM HIGHWAY IMPACT STUDIES

Several findings or inferences can be drawn from highway impact studies. Some of these involve a synthesis of study findings and some result from experience with the studies. These findings involve observations about quantifying study results, the value of diverse and unofficial studies, land value analyses, the need to use impact findings, and environmental considerations.

Quantifying Study Results

Highway impact studies typically identify affected groups and describe how these groups are affected. Where possible, these effects are reduced to numbers. Impact studies, however, typically pay more attention to the way benefits or effects are distributed among affected groups than to the reduction of these effects to a final number, benefit-cost ratio, or rate of return. Impact studies do ordinarily identify and array all relevant effects even though these can seldom be added together or to user effects to provide a net amount of impact. There is general and current recognition that no useful purpose is served by insisting on quantifying all benefits or effects. Congress, for example, has insisted on being told which groups are affected, and in what ways, and

may elect to forego overall benefits of a program (e.g., highway billboard control) if the effects on selected groups are considered to be unacceptable.

Researchers at Stanford University, recognizing the problems involved in using a value about which they were unsure, presented their findings for noncommercial time saved along highway routes in terms of time saved rather than in dollars, recognizing that noncommercial time saved has not yet been priced satisfactorily (18). This is a retreat from many earlier studies, and one that those analyzing BART may want to consider. Unless trip purpose is given close attention, placing a price on time saved may provide misleading results. For some highway trips and perhaps for some transit trips, time savings may be unimportant. Time saved while joyriding should not be regarded as a benefit.

The Value of Several Unofficial Studies

Sufficient effort needs to be made to provide an overall evaluation of a facility's effectiveness. Because time and money are usually limited, the insistence on the ideal study that will identify and document every effect is seldom practical. More analysis than can be afforded will almost always be needed. Because of this, encouragement should be provided for research efforts by students or others in addition to whatever official or major study is done. Highway impact study experience suggests that inexpensive research efforts can be very useful. They avoid many of the problems accompanying large studies: delay because costly studies require planning and funding decisions by managers whose time is limited, delay because of coordination problems between two or more levels of government, and delay because study findings need to satisfy the sponsors before being released. For these reasons, the workshops during this conference should perhaps attempt to design research tasks not only for a large, integrated effort but also for small, independent studies.

Experience with highway impact studies also suggests that more objective and useful evaluations are provided by researchers outside the operating agency. With a few exceptions, highway impact studies by universities and consultants seem to have been superior to those done by operating agencies. Operating agencies also appear to need the help of independent analysis on matters such as social, economic, and environmental effects more than on questions of traffic flow and direct costs.

Land Value Analyses

Land values are, of course, only one of the indicators used in impact studies. Land value analysis can provide an objective check of other indicators of change, e.g., opinion surveys or land use change. In fact, some such indicators need such checking with other indicators. Land use changes alone, for example, may not show anticipated changes that prudent investors may already be discounting. Land values can be an indicator of all the various direct and indirect impacts affecting property, whether the influence is a parkway, a noisy arterial, or a transit station (19).

Land value information is also often necessary to (a) answer questions local governments have about tax roll effects, (b) provide compensation for those displaced, (c) evaluate the feasibility of airspace development, and (d) acquire land in advance of actual need or in excess of needs. This latter need is becoming more important as support grows for having the transportation agency share in the windfall gains occurring near these facilities and as high interest rates complicate the feasibility of acquiring excess land. Land values have already received considerable attention in some analyses of transit effects (2, 20, 21, 22).

Impact Findings Should Be Used

Highway impact studies have undergone changes through the years. Early studies were intent primarily on learning about highway effects. Impact researchers are no longer satisfied to identify and measure highway effects. They now emphasize ways for using the impetus that highways provide to achieve broad community goals (26, 27, 28, 29, 30, 31). It is encouraging that transit studies and study plans recognize the need

to ascertain the effects of the system and also to perceive what adjustments can be made to improve the effectiveness of the system.

Environmental Considerations

Some highway studies have underemphasized environmental considerations. This hardly seems a danger for transit studies; some analysis of this has already been done (23). Even so, a technique used in a National Cooperative Highway Research Program study (24) may be useful in transit studies. This involves analysis of public attitudes concerning matters such as the ideal mode for different types and lengths of trips and an evaluation of service provided. An approach of this type could be used to find out the extent to which BART improves the image transit has had in the minds of many travelers (25).

CONCLUSION

Looking back, one may regard some highway impact studies as being less definitive than desirable. Questions asked about transportation systems today are more searching and complex than many of the questions asked at the beginning of the early impact studies. Study methods are also more sophisticated, and more research money is available than when highway impact studies began. Thus, highway impact studies are not as relevant to an evaluation of a system like BART as are land use and planning studies such as BATS, BASS, and PLUM. Even so, it may be of some help to those who will evaluate BART to know that many of the same characteristics analyzed in highway studies are among those analyzed in some transit studies—land use, employment accessibility, education, cultural and recreational opportunities, real estate and tax roll effects, civil defense, and effects on life style and the environment.

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