

interviewing persons who resided on the subject land. Interviews were made to obtain data on road use.

The next step was to apply statistical techniques to associate the position that the studied parcels of land had on the road system (this position defined in terms of road use) with the land value structure of the area. In each of the three study areas the road system was divided into three types (hard surfaced roads, gravel roads, and dirt roads) and property values were associated with each of these road types.

The chief techniques used in the Washington studies were the travel interview, which has been highly standardized and is known to be reliable; data from public sources, for land values; and standard statistical procedures, used to determine associations between roads and their uses and property values.

The paper "Obtaining Data for a Highway Impact Study" (See Appendix E) elaborates the remarks just made on the way data were obtained from public documents and interviews. "Statistical Analysis of a Road Improvement Impact Problem" (See Appendix E) deals with the rural studies and explains the kind of statistical model that was employed for the estimation of associations. There were several difficult estimation problems. Originally we had only primitive and intuitive notions about road uses in rural areas and how road improvements might change road uses, and thus the values of places served by roads. Because of this lack of a priori knowledge we needed a statistical model that could be used in a "fishing expedition". In other words, what was wanted was a model that could be applied in different circumstances in different ways to try to find best approximations. The model developed fitted that requirement. Different functions were tried to describe the way land values change with road changes until functions that would fit the data were found.

Another subject in the paper on the statistical model that is of particular interest is the discussion of methods used to verify the model. The fact of changing the road system may very well change the system of behavior (that is, how roads are used) that generates land values. This is a complicated problem.

The third paper, "A Source of Theory for Highway Impact Studies" (See Appendix E) discusses the problem which was the chief handicap during the studies. There were no "sharpened" statements (theory, intelligence, or a priori knowledge) directly related to the kind of problem under investigation. There was no guide to tell what the situation ought to be; nor how to relate experience of previous researches. This short paper is a statement of the highway impact problem as one of relationships among locations. A bibliography attached to that paper brings together materials from location theory to serve as a systematic source of information to guide highway impact studies.

The Dallas Expressway

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A study of the North Central Expressway of Dallas, Texas, is now being carried out. When this work was begun it was hoped that someone else had done such a study so that there would be available a worthwhile base to improve upon. It was found, however, that apparently no one had done such

a study as well as had been hoped for.

The first objective of the study was to determine changes in market value both of properties in areas presumably affected by the Dallas expressway and in non-affected areas. Those familiar with the Houston-Gulf Freeway study recognize here a common objective.

The second objective was to determine changes in tax valuations in affected and non-affected areas. The term "valuations" is used because these are true values or appraisals, rather than just assessments which might be a changing proportion of the appraised value.

The third objective was to determine changes in land use in affected and non-affected areas. It was felt that this should be limited to general land use as it might be reflected in value of improvements added, etc.

The fourth objective was to determine incentives for business and residential location along the facility. Persons who were located on properties abutting the expressway were interviewed. Information was obtained on number of employees of businesses and the general attitudes as well as incentives. The interviews did not extend beyond the abutting band of properties.

One factor that has pervaded our thinking is that insulation between properties and expressway influences builds up rather quickly, especially in high-density residential areas. In an established residential area there is perhaps some immediate influence from an expressway, but after the first few tiers of lots a measurable influence may disappear altogether.

A problem that requires further attention in the study of economic impacts of roads is that of delimiting the areas of influence of such a facility. In the Dallas investigation a 5.4-mile stretch of the expressway was chosen for detailed study. This section was chosen because of the desire to limit the research to an urban area, and this was the only urban stretch that had been completed for a long enough period to have brought about appreciable land use change.

An attempt was then made to determine affected areas along the 5.4-mile section. First we sought to find out what effect the expressway may have had on certain types of travel. Roughly, this was done by calculating time savings in travel to downtown Dallas from a large number of locations, all major thoroughfare intersections, as far out as expressway use resulted in time savings over the quickest non-expressway route. Time savings data were then converted to "route preference" lines by the use of an empirical curve of the relationship. 5/

One route preference line was drawn along which 50 percent of drivers to downtown Dallas would chose to use the expressway. Other lines showing 60, 70, 80 and 90 percent preferences to use the expressway were interpolated. Each particular line, however, outlined an area to broad for detailed study. Other methods using travel times were attempted without an improvement of results. The 50 percent line later was used in that control areas are located outside of this line.

The subsequent decision was to study abutting properties as one distinct type. Then, to broaden the base for comparison, behind this initial

5/The curve used was from "Effect of Travel Time and Distance on Freeway Usage," by Darel L. Trueblood. Highway Research Board, Bulletin 61, p. 18.



A portion of the Gulf Freeway as it approaches the four-street system at Houston, Texas. Note the extensive and substantial private development along the expressway. A fifteen-year study of land values and land uses along the urban portions of the Gulf Freeway has just been completed under the sponsorship of the Texas State Highway Department.

band about a two-block strip on either side of and parallel to the facility was studied. After further consideration it was decided that a third band was needed to extend the base for comparison.

Next in order was the selection of "control areas." These comparable areas ideally should be so far removed from the expressway that it can be assumed that its economic impact would not be measurably felt in them. Thus they would afford a standard for measurement of the impact of the expressway on affected areas.

The control areas were selected by consulting with tax people and realtors, plus other persons that were thought to know Dallas well. They were asked to look back to 1941, which was the first year of the base period for this study, and try to pick areas over the northwest and northeast quadrants of Dallas that, in many attributes, would have been comparable to what had existed along the expressway route before it was built.

Other factors besides general location were checked. The persons who were suggesting the comparable control areas were asked to keep in mind their distance from downtown, the presence of a railroad, racial islands, approximate time of development of these areas, and of improvement for the properties, the types of properties, zoning regulations, and other related factors. Old maps were also checked, but were found to be of limited value.

A number of independent opinions were obtained as to what areas would compare with the study areas along the expressway, and from the consensus, fifteen different areas were picked.

In the choice of these control areas the findings can be materially influenced, but care was exercised that the biases were removed or resolved insofar as they were recognized.

It was decided to use tax records, not only because one of the objectives was to see what advantage was taken of increased land values for tax purposes, but also to serve as a second index of values and to furnish gross measures of land use changes.

Confidence was lacking in real estate sales as an index of value, especially for small areas. For example, in dealing with a very small area and a very small number of sales, sizable errors can creep in purely by chance.

Some of the sales information came from Dallas County plat books; the prices paid were verified in warranty deed records. On those deeds not giving sales prices, the upper limits of prices, as calculated from internal revenue stamps, were used.

The tax appraisal data, or true tax values, as they are called, were obtained from city tax records. Since they are tax appraisals, not assessed values, no manipulation was required.

The permissive uses were obtained from the city zoning map. Land area was taken from the county plat books and verified in the city tax records. Information of incentives and location for attitudes toward the facility were obtained for abutting properties by interview. Sales prices for inflation were adjusted by using a dollar value index of consumer prices for Dallas.

Attempts are being made to adjust sales for variations in improvements by the technique used by Elder in the Gulf Freeway study. The technique

was to take the improvements evaluation for tax purposes, apply a construction cost index factor to it, and subtract this product from the sales price. The remainder was then considered to represent the price paid for land only. This technique, although it adjusts for variations in types of property that are sold, probably does not give a remainder that represents the price of land alone.

The amount of statistical work involved was insurmountable by hand; therefore, the magnetic drum calculator was used and a method worked out whereby all the methods that were applied to sales information were used in one quick operation of the machine.

Farmland Values of the U. S. Department of Agriculture

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The rural studies carried on by the Department of Agriculture have been primarily in cooperation with the state agricultural colleges, usually employing people with training in land economics. Currently being planned is a series of studies in the Great Plains area, on a sample of about 35 counties, in which graduate students will be used for field supervision of enumeration. This will be an interview survey in which sellers and buyers of farm property will be contacted. Apart from this survey the Department has a continuing research project, in which estimates of farm real estate values submitted three times a year are compiled and analyzed. These are subjective estimates made by farmers as to market values in their localities. In some areas these estimates reflect such market factors as location and non-farm use, in addition to agricultural value. They are useful for measuring general movements in market values by states and regions, and may have some utility for rights-of-way valuation problems.

In the regular research work no specific studies have been made of the impact of highways upon the values reported, but we have been increasingly aware of such influences through reports obtained from the local reporters. These reporters incidentally, are dealers, local brokers and abstractors who report regularly. For instance, when the Ohio and Indiana turnpikes were being built, reports were obtained on the impact of those highways upon rural property values extending north and south from the highway as farmers attempted to relocate themselves on other farms. In fact, the last survey (November 1956) contained a specific question along this line. About a third of the reporters said they had observed some non-farm influences operating in their local areas. Such influences are largely concentrated, of course, in the Southeast, the East and the West Coast, with low incidence in the Central Plains and Central Corn Belt areas.

A report, "Current Developments in the Farm Real Estate Market," is prepared three times a year on these general trends.

The question arises as to what extent we are limited in our thinking by measuring only the changes in values that have occurred up to the date of a study. There is a flow of benefits being created by highway programs which should be recognized. Many of these benefits are yet to be realized and will occur over an unknown number of years in the future. People are generally slow to readjust their concepts of value, certainly of farm property. Among farm people it may take a number of years before the full economic significance of a highway is appreciated and is translated into rural property values.