

cities. The usefulness of personal interviews for this type of research has also been explored and it has been proved that the personal interview as such has not contributed much to a sound study in California. The sales tax returns or some such source of information, rather than personal opinion, is much more effective.

The second type of studies has been on land values adjacent to free-ways. Available sales data both before and after the highway improvement have been used, with an attempt in every instance to get resales of identical property. This is a continuing study, one that is simple in technique but effective in use.

Some of the data on these properties are particularly useful to the appraisal sections in the everyday work in right-of-way acquisition. In fact, the data are the basis for all appraisals as they pertain to compensation for land and improvements taken and any damage to the remainder. Every highway department probably has insufficient information on the damage factor on properties. In fact, we have begun to feel from the data gathered to date that the damage concept, as such, is erroneous as approached from the appraisal process. The appraisers are continually looking for damages rather than benefits. The California studies have indicated very little in the way of damages and a great deal in the way of benefits.

For research on a long-range program, we are well aware that this may extend over an entire area. For immediate application however, the use of sales data provides a simple technique that is invaluable to present at these hearings.

An indication of the necessity for this type of immediate research by the highway departments is contained in a recent conversation with a highway commissioner in Los Angeles. He asked for some information that could be presented almost immediately at a hearing on the effect of controlled-access highways on adjacent residential properties. Fortunately, we had just completed a rather extensive study of residential properties throughout California, including catalogued interviews for more than 1,000 properties, but only those adjacent to the freeways on which there have been resales were used for this particular purpose.

As a basis for the analysis, 540 adjacent residences were found. They were identical with non-adjacent properties within the same sub-divisions, and were sold in like manner and at the same time. The same typical pattern was found throughout the state in each of the studies. This type of material provides a practical application to a current problem.

Washington State Studies

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Three studies sponsored by the Washington State Council for Highway Research and the Interim Committee on Highways, Streets, and Bridges of the state legislature were undertaken over a three-year period. The studies as a whole were in response to a variety of problems posed by highway improvements and the tax situation in the state. These studies were summarized at the 1957 Annual Meeting of the Highway Research Board by R. G.

Hennes 2/ and are reported here in Appendix E.

One of the studies was undertaken by Professor Bayard O. Wheeler, Department of General Business, University of Washington. He was concerned with the impact of urban expressways on urban land values. Another study, undertaken by the speaker, was concerned with the impact of improvements in rural areas.

Land values were studied in order to determine what happens when one changes the road situation in an area. Land value measures are attractive for highway impact studies because there are in land valuations actual measures of how persons have placed value on land as a result of the road situation. As the road situation is changed, land values may change; thus, there is a measure of the value or "benefit" of the change in the road situation.

The urban study was concerned with the effect of expressways on urban land values. 3/ It is common knowledge that land receives dramatic benefits when expressways are built. Perhaps these gains could be a source of finance for the building of these very expensive facilities. At any rate, knowledge of benefits gives information on the benefit situation within which road improvements are made.

The study proceeded by analyzing the general structure of land values in the Seattle urban area prior to the building of the Lake Washington floating bridge, then making a study after the bridge was constructed to see how the pattern of land values had changed. The bridge served as an approximation of "the expressway." The pattern of values in the city has, of course, changed. There is no question but that improved access to the Seattle area through the building of the bridge to the east and the opening up of new lands tributary to the city center have had vast effects on these changed land values. The study served to trace these out.

The study relating to rural road improvements had somewhat different dimensions. 4/ In Washington there are a variety of rural landscapes. One case is the typical metropolitan area-rural landscape, where the city is sprawling outward over the countryside. Here the rural landscape is changing, farms are changing into suburban property. The improvement of roads quite obviously can accelerate or decelerate these changes. One study dealt with rural areas subject to such urbanization.

Another rural study was concerned with an area of extensive wheat farming because these farms form another important kind of rural landscape in the state. The third kind of rural area that was studied was one of oasis farming; specifically, an area of apple farming near Wenatchee.

Each study proceeded by observing a series of land values and then

2/Robert G. Hennes and W. W. Mylroie, "Allocation of Road and Street Costs, State of Washington," and R. G. Hennes, B. O. Wheeler, and W. L. Garrison, "Washington Highway Economic Studies." Proceedings, Highway Research Board, (1957).

3/Bayard O. Wheeler, "The Effect of Freeway Access Upon Suburban Real Property Values." Washington State Council for Highway Research, University of Washington, Seattle, Wash. (1956).

4/William L. Garrison, "The Benefits of Rural Roads to Rural Property." Washington State Council for Highway Research, University of Washington, Seattle, Wash. (1956).

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