

The Impacts of Highways on Environmental Values

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ABRIDGMENT

•THE National Cooperative Highway Research Program of the Highway Research Board was requested by the American Association of State Highway Officials to "develop a practicable method for evaluating the effects of different types of highways, and of various design features, upon environmental values." The research to develop this method is to be conducted in 2 phases. The objective of Phase I is to design a research program to be conducted in the second phase. This is a summary of the conclusions reached in Phase I of this NCHRP research project 8-8. The conclusions describe the objectives to be achieved and the research to be conducted in order to develop a practicable method for evaluating the environmental impacts of highways.

The impacts of highways on environmental values are many and complex. The construction of a highway in a congested urban area constitutes a major public intervention in the fabric of a city. Many different people and interests are affected by the highway, whose overall effect must be viewed as the total set of its effects on all groups. In order to reach a decision as to which of several possible highway alternatives is most desirable, the full spectrum of impacts of a highway must be weighed. The objective of an evaluation method is to be able to summarize all the community interests concerned in order to determine which alternative, if any, will result in the most desirable set of impacts.

Evaluation must deal with seemingly incommensurable quantities such as construction costs, loss of tax base or parkland, effects of a highway on neighborhood stability, and displacements of families or jobs. Short-term impacts must be considered as well as long-term effects. Perhaps the most difficult issue of all is that evaluation must consider the balance between those groups who are affected negatively by a highway and those who benefit; evaluation must reconcile the differential impacts equitably. An evaluation method must be responsive to the diverse needs and values of the different groups who will be impacted by a proposed highway.

To be practicable, an evaluation method should be adaptable to different contexts, including variations in the significant issues about environmental values in different cities and variations in project scope and resources. The dynamics of the location process must be recognized. An evaluation method should be used not just once at the end of the process to choose between well-developed alternatives but many times throughout the location and design process in order to influence what is done in that process. An evaluation method must consider all impacts, not only the quantifiable, and must explicitly consider the differential incidence of impacts on various groups. The method must strike an appropriate balance between surrogate approaches, in which the professional attempts to estimate the values that people place on different impacts, and interactive approaches, where people express their choices directly.

Perhaps most important of all, the method must recognize that it is not possible to get a complete, consistent, operational set of values that represent the consensus of the community affected and can therefore be used for evaluation. Individuals do not know their own preferences in a complete, consistent form, and their values change over time. Although they cannot express their values in the abstract, they are able to choose between a small number of alternatives, and the act of making a choice helps them to clarify their values. Thus, an evaluation method should not assume the exis-

tence of a measurable set of values but should be explicitly structured to help people to clarify their values in the context of making choices.

There is a positive thrust possible for evaluation. An evaluation method should help to identify crucial trade-offs. From the viewpoint of equity, evaluation should help identify which groups are hurt and which are benefited. By identifying inequities and possible conflicts, evaluation should stimulate the highway planners to search for imaginative designs that reduce the inequities and conflicts. By displaying feasible trade-offs, evaluation should provide a factual basis for negotiation among affected parties. Evaluation should involve the people affected in the negotiation of an equitable program of action. In highway location particularly, the range of options for negotiation is broadened by the concepts of joint development, multiple use, and corridor planning. Evaluation should incorporate these options and should assist in identifying the compensation appropriate where other options fail.

The basic objective is to achieve an equitable, substantial agreement on a course of action. Evaluation should play a positive role in the location process by helping the groups affected to clarify their own values through displaying the alternatives and their impacts, by helping to identify crucial trade-offs, by stimulating the search for new alternatives, and by producing a ranking of the alternatives when necessary. To achieve this, the proposed evaluation method has 2 components: evaluation technique and evaluation strategy.

An impact matrix displays, for each alternative action, the impacts on each interest group. The evaluation technique consists of a set of operations that can be applied to the impact matrix. These operations are used to condense the information in the matrix in order for the location team to develop its perception of the issues. Particularly useful operations are analyses of the differences between actions, explorations of trade-offs, sensitivity analyses, and break-even or equivalence analyses. Linear scoring functions, cost-benefit analysis, and other standard but limited evaluation techniques are special cases of the more flexible evaluation technique proposed. The technique proposed is flexible in order to allow different approaches to be used at different points in the location process. It is not expected that the evaluation technique will be used to produce a ranking directly. Rather, it will be used most often by the location team in a variety of ways in order to build up their understanding of the issues, which will then provide a basis for judgment about the ranking of the alternatives.

The evaluation strategy is the broader process that develops the information on which the evaluation technique can operate. Evaluation strategy includes the development of alternatives, the identification of actors and the prediction of the impacts on them, the gathering of information about the values of the different actors, and the use of the evaluation technique to produce a ranking. The notion of evaluation strategy arises from a conception of the location process as consisting of 3 major types of activities.

Location-design activities will develop the alternatives and predict their impacts, thus generating the impact matrix. Community interaction activities will generate preference information, through interaction between location team members and all elements of the community, occasionally using information from the impact matrix. Location team strategy activities will use preference information and the impact matrix to accomplish evaluation as needed, while also controlling the flow of resources in the broader strategy of the location process. A 4-phase location strategy is suggested: initial survey, issue analysis, design and negotiation, and ratification.

A research program is described to develop the proposed evaluation method. The major activities to be conducted include case studies, development of the evaluation technique, information display techniques, community interaction techniques, checklists, and location team strategy as first priority areas, and the development of impact prediction models and situational data as second priority areas. A field test will be conducted to assist in evaluating and refining the techniques. The results of the research will present the evaluation method in 3 manuals, incorporating the techniques and other material to be developed: an orientation manual, a manual on community interaction techniques, and a manual on location team strategy, including the evaluation technique.