

SESSION FIVE

Friday, September 18, at 1:00 P. M.

DETERMINATION AND MEASUREMENT OF EFFECTS OF HIGHWAY IMPROVEMENTS ON OTHERS THAN DIRECT USERS OF THE HIGHWAYS

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Highways as an Instrument of Economic and Social Change

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● **PROGRESS SEEMS** to be inextricably infused with the process of evolution from the primitive to the complex. Transportation is a conspicuous factor in this process: from the subsistence farm to the supermarket is a development brought about largely by the exchange of commodities through transportation. The comprehension of modern commerce, and the transportation upon which it depends, presents a far greater challenge to the intellect than does the food-gathering activity of some primitive tribe. These challenges can be coped with only by simplifying a situation by ignoring all but the dominant factors. Then we are able to formulate relationships between the chief causes of the observed effects, to establish models, and to predict the nature and often the magnitude of the consequences of a series of actions. The ability to quantify is deeply imbedded in technology; it is responsible for much material accomplishment; it is a wholly admirable achievement of our times. But the trick in this technique is the simplification of the initial problem; if in the course of time some factors, originally trivial, grow in importance until they exercise a controlling influence on consequences, the conclusions will be erroneous, and the methods inadequate.

In retrospect the engineer of fifty or seventy-five years ago seems to have enjoyed far greater latitude in decision-making than his modern counterpart permits himself to have. Ira Baker's "Treatise on Roads and Pavements," first published in 1903, was still extant in its later editions during the road building boom of the 1920's, but it is more in tune with the circumstances of the present era. Baker wrote before the automobile came to dominate the scene. Baker's engineer actually did view highways "as an instrument of economic and social change." Good roads permitted the farmer to participate more fully in social and political activities. Good roads brought his children closer to school and his crops closer to market. The value of fuel and time consumed in vehicle operation (the usual "user benefits") were not in themselves significant factors. For the hay-burning prime-mover, fuel was a fixed cost — not a variable cost. So also with the wagon or buggy, which stood idle in the barnyard when it was not on the road. On the whole, even the alternate value of the farmer's time was negligible, because crops were hauled after the work of production was complete, and personal travel was either after hours or combined with other trip purposes. The city dweller paved his streets to keep his feet out of the mud, not to reduce the cost of

vehicle operation. Pavements made urban living more attractive, and so contributed to the urbanization of society.

But these social objectives had little to do with the pressure for better roads which automobile owners exerted after World War I. The existing rural highways were paved primarily to improve vehicle operating conditions, and the car owners were willing to pay the full marginal costs of these improvements. Presumably, their willingness to pay the costs was predicated on the assumption that the benefits they received outweighed the charges that they incurred. In such a situation the ratio of benefits to costs was the ratio of user benefits to user charges, and this ratio constituted a logical determinant of project acceptability. Road improvement still did provide social benefits, but these did not motivate the road-building boom and they were ignored in the shadow of traffic-minded good roads associations and automobile clubs.

As the good roads movement reached substantial proportions engineers tended to abandon the intuitive judgments that had formed the basis for policy decisions during a more primitive road-building era. This transition in professional methods took place for two reasons. First, the engineer or administrator must find refuge in some sort of objective measurements whenever political pressures inflict personal penalties for unpopular, undocumented decisions. Second, the magnitude of road-building activity multiplied ten times during the first quarter-century. Expansion on such a scale induces a shortage of professional talent. Decisions must be delegated to subordinates, who must be guided by definite standards and who must follow work patterns susceptible of review. The ratio of measurable user benefits to measurable costs provides an ideal professional tool in the circumstances just described. The most readily measured user benefit is the reduction of vehicle operating cost, and this procedure becomes even more plausible if value is placed upon time savings. Of course one may conjecture that even in the 1920's motorists desired pavements more for their own comfort and convenience than to save gasoline or time; but there still should be a good correlation between the two sets of factors, and if some scale differences remained error was inconsequential while there was a perpetual shortage of funds for building all the roads that had favorable benefit-cost ratios.

Actually, operating in that climate the engineer has had two principal questions to answer: where does the motorist want to go, and can such a road be built at a justifiable expense? Benefit-cost ratio was developed to provide a methodical solution to the second question, and in the case of the first question another mechanistic device was contrived to circumvent the need for exercising intuitive (and hence fallible) professional judgment. This was the origin-destination survey.

Taken together, these two tools are admirably adapted to the task of undertaking a large-scale system of road improvements wholly for the benefit of the users of the facility. The experience which led to the formulation and adoption of these techniques was experience acquired, for the most part, between the wars when American engineers were completing the job of taking over a pre-existing system of roads and streets, and making it over for the use of the motor vehicle. These same tools would not have been equally valuable in the horse-and-buggy days of Ira Baker, when vehicle operating costs were a less significant factor in determining the need for road improvement.

The question might well be raised at this point whether the combination of O-D surveys and B-C ratios is still sufficient for the present purposes; that is, whether the present program of expressway construction represents a continuation of the interbella period of road construction, or whether it may involve a return, in part, to the road-building climate of fifty years ago. It is noteworthy that the pressure for local road improvements once more comes principally from community organizations and chambers of commerce; the surviving good roads organizations and the automobile clubs are less vehement advocates for bigger programs and are more concerned about paying for them. Without too much exaggeration one might speculate that the job of renovating yesterday's roads for the automobile has been finished, and that tomorrow's expressways have consequences for the community and property owner as well as for the motorist. This returning recognition of the social importance of highway improvement is not just another cyclical swing, but rather a return to fundamental values after a temporary lapse caused by the concentration of attention on the vehicle. The anticipated growth of population

is in itself sufficient assurance of this. Meier (1) predicts that eventually 70 to 90 per cent of the population will need to be urbanized. He anticipates the development of super-cities, with almost continuous urbanism extending for hundreds of miles. Doubtless the megapolis will require new and special forms of transportation, but the urban expressways seem to be at least a transitional prerequisite to the development of these complex assemblages of central and satellite cities. Under such circumstances the expressway acts as a catalyst — bringing about reactions much more important than itself, social changes which might make the expressway obsolete eventually.

Garrison has studied in some detail the impact of highway improvement on various elements of the economic structure of the community; these highway-induced changes are dynamic aspects of the urbanization process. In his most recent work (2) he reports sample studies of fundamental aspects of the geographical organization of economic life, emphasizing the influence of highway change. An interesting example, selected for the quality of data, dealt with the utilization of physicians' services, as affected by transportation. Improvement in access induces changes in the location of physicians, it confers monetary benefits on physicians, and it gives patients more medical service at lower unit cost. He also examines the spatial arrangement of business establishments and the sensitivity of existing arrangements to highway improvements. Some types of business tend to cluster; others tend to string out along an arterial strip; still others are less selective in this regard. The channelization of larger percentages of total traffic into expressways changes the spacing and size of these nuclei, it strongly affects arterial-strip development. The development of expressway systems triggers a whole set of interactions which determine, in part, the character and the growth-potential of urban areas.

Some of the internal stresses, or tendencies, which await release or which are stimulated into activity as transportation improves, have been discussed by Horwood (3). He notes that while the scale of activity in central business districts has held steady through recent years, on a per capita basis there has been some decrease. This has been more evident in retail sales than in office space. He finds that the core of the central business district is changing from a retail-oriented complex to an office-oriented complex. By and large, he states, the absolute gain in the office labor force, as determined by space change, has more than offset the loss in retail sales employees. His most significant deduction is that intercity transportation improvement will have a greater impact on the CBD than improvement in intracity transportation. Regional capitals will experience more CBD growth than will the lesser cities in their hinterland, due to the continual formation and concentration of new activities in the CBD which require central linkages.

The collection of evidence of the highway influence on business activity and land values has been going on in all parts of the country during recent years. The motivation of this research is evidence of a growing realization of the importance of these highway-induced changes in off-highway activity. It is of more than passing interest that many, perhaps most, of these studies were initiated to allay the fears of communities or economic groups that specific highway changes would adversely affect land values or the level of business activity. It is only natural that these people should differentiate between the "negative benefits" which they fear might be imposed upon them as owners of land or businesses, and the "positive benefits" which they might expect to receive as highway users. Reduced taxation through lowered valuations is not recognized as adequate compensation in such instances. However, if distinguishable injury can be caused by highway changes, distinguishable benefits should also be possible.

If social and other non-user benefits can result from highway improvement, should such benefits be considered in the justification of highway improvement? From a practical standpoint a compelling reason for the consideration of non-vehicular benefits lies in their influence on highway policy. As a matter of historical record, current interest in economic impact originated in the political pressures exerted by communities fearing the economic effects of being by-passed. The selection of major bridge as freeway locations is approved, rejected or postponed through the influence, in part, of local pressure groups. If, in reality, location and investment decisions are to be importantly influenced by consideration of non-user benefits it is most unrealistic to omit such

benefits from consideration in computing a benefit-cost ratio or the rate of return on the investment.

The larger considerations of the national, and local, interest in the long run, lead to the same conclusion. The prospect of the great urbanized areas which are to come, and in which the standard of living will depend upon efficient transportation under most difficult conditions, should compel recognition of social objectives in setting highway policy.

Policy decisions which include consideration of social benefits and social costs will not necessarily agree with policy decision that considered only vehicular benefits and highway costs. It is important that highway users should not pay the entire cost of improvements which are built differently than traffic considerations alone would require. This is true for reasons of equity; it is also expedient. Since local pressures are significant factors in the implementation of policy, it is desirable that these local pressures be subject to the realistic weighing of cost against benefit. This is not possible where benefits come free. In order to achieve some sort of proper balance of power between conflicting pressure groups it is desirable that each group should have to weigh its share of the cost of the facility against its anticipated benefit.

Whether such a concept is practical or not becomes a relevant question. If non-vehicular benefits can be measured, there are various devices by which corresponding charges against the beneficiaries can be collected. Benefits to the general public are, of course, diffused to the point where they are best charged against the general funds of the appropriate community, state or nation. A bridge might, for example, create a large new residential area at one portal, while its effect at the other end would be to raise the general economic level of the community through increased retail trade. It would be appropriate to recognize the increase in land value by an assessment, while the charge against the community at the other end could be met by an increase in the mileage.

If the Interstate System is found to confer large non-vehicular benefits on property owners and communities along its route a similar disposition of tax responsibility would seem to call for the imposition of property taxes by the Federal government. However, it would be possible to accomplish comparable results by other means. If the monetary cost were appropriate to the findings of responsibility, for example, the cost of interchanges could become the responsibility of local government. Intersections of interstate routes would be exceptions to this rule. Intersections of interstate routes with state primary routes also could constitute some sort of variant to the general rule. Interchanges in incorporated communities could be charges against the general fund; interchanges in suburban areas could be charges against local improvement districts composed of the land which gained access.

One objection that might be raised against collecting part of highway costs from others than highway users is that this would violate neutrality in the competition between rail and highway common carriers. Two comments might be made on this criticism. First, 75 percent of the motor freight movement is restricted to a very few intercity routes. It is not an appreciable factor on 90 percent of the road and street mileage, at least in Washington State (4). Hence, while neutrality should be observed, it does not of itself furnish a broad enough base for establishing over-all highway fiscal policy. Second, competition between rail and truck is largely limited to hauls over 300 miles (5). A recent writer states, "The scanty information that is available suggests that discrepancies between user costs and user taxes have been vastly over-exaggerated in some circles. The only flagrant violations, presently discernible, would appear to be those of diesel trucks and certain inland waterway operations. Furthermore, correction of even these abuses would probably not have much impact on the allocation of transportation resources because of the costs involved are small compared to total costs and rates." (6)

Regardless of the particular characteristics of whatever devices might be developed to collect appropriate costs from non-vehicular beneficiaries, it seems reasonable to assume that such devices could be found, and that they would serve a useful purpose. Before any such tax reform can be put into effect in any one instance, the benefits must be measured.

But the determination of social benefits is the area on which much more must be done in the directions suggested on preceding pages. Until all non-vehicular benefits can be expressed in quantitative terms we cannot modernize benefit-cost ratios to include all benefits which presently motivate highway investment. Lacking such precise instruments, the engineer or administrator should once again accept the responsibility for exercising some measure of intuitive judgment in the discharge of his responsibilities. To ignore realities because we cannot find numbers to put into formulas would be most unfortunate. It would mean that we were the willing victims of our own technologic success, confined by rules we had ourselves invented to fit other circumstances. Perhaps in the transitional period until all benefits and costs can be counted, only those projects should be authorized which have satisfactory user benefit-cost ratios, but that priority among the approved projects should be influenced by social benefits and costs.

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