

On the Incremental Analysis of Highway-Cost Responsibility

R. G. HENNES, Professor of Civil Engineering, University of Washington;
Chairman, Washington State Council for Highway Research

● THE first problem inherent in the incremental theory is suggested by the term itself. The word "incremental" implies the existence of a base to which increments are to be added. After some basic road standard has been assumed, it becomes possible to determine rationally the additional costs involved in the higher design standards, which are necessary to extend the usefulness of the road for heavier vehicles. This is not to discount the grave problems of data and of professional judgment which still remain; nor to deny the possibility of arbitrary decisions on controversial details.

The selection of a basic road will always be subject to criticism and disagreement. Consequently, the decision should be reached with the objectives of the study clearly in mind, and with full recognition of the practical implications of all assumptions.

THE MATTER OF OBJECTIVES

Any highway tax study is motivated either by the need for more money, or by a desire for greater equity in the distribution of the existing tax burden, or by some combination of both motives. Rather commonly, an important consideration in authorizing the study is a feeling that some particular class of vehicle (for example, heavy trucks) is paying more or less than its share of highway costs. Under such circumstances it is natural to choose for the basic road a facility designed exclusively for passenger car traffic. This assumption is right and proper, if the scope of the problem has been correctly gauged, if our concern is whether at the current rate of highway expenditure each vehicle group bears its fair share of the bill.

However, the attainment of complete tax equity between automobiles and trucks would not in itself assure adequate support for an adequate system of public roads and streets. Highway economists would be at fault if they failed to recognize the popular mandate for road facilities far superior to those which existing revenues are able to provide. No matter how these superior facilities are to be financed, the cost will ultimately be repaid from revenues, necessarily based upon higher rates.

Thus the problem is not really to determine the equity of the allocation of today's road costs. It is to find an equitable plan for meeting the expense of tomorrow's program.

A STABLE BASIC ROAD

Even though changing traffic creates constantly changing road standards, it is possible and helpful to conceive of a basic standard that does not change. Any base should represent stability rather than flux. A basic road chosen to accommodate automobile traffic means one thing today and another tomorrow. To find a basic road which will have permanent meaning we must go back 50 years to the period immediately before the influence of the automobile became a factor. The highway treatises of that period describe road standards applicable to the type roads found in each of our modern administrative systems; county, city and state. Such basic roads provided land access and permitted the exercise of governmental functions at all levels of government. Modern road improvements are incremental to those bases. Except for the tremendous expansion of road use which followed the development of the internal combustion engine, the expense of modern highway development would have been avoided, nor would there be justification for the user taxes which have paid most of the bills.

THE SHIFT IN HIGHWAY EXPENDITURES

Another consideration which argues for a comprehensive sort of tax theory is the radical change which is taking place in the pattern of highway expenditures. The urban expressway does not fit neatly into any of the traditional road systems which had been evolved for administrative and financial reasons; and the compromises which have

permitted expressway construction have varied expediently with circumstances and with geographical location.

Because the expensive expressways are functionally intermediate between city streets and intercity state highways, a satisfactory tax theory must embrace both systems. Here it is relevant to recall that the one system has been built, largely, with property taxes, and the other largely with user taxes. The problem of meeting expressway costs transcends the division of cost responsibility between car and truck, or it will forfeit the traditional property tax support for city streets by default, rather than by a conscious act based upon rational judgment. Even if the conclusion is correct it should be reached through deliberation, not by oversight.

If the pre-automobile road is taken to be the basic road, the first increment should be the cost of improving that road to accommodate automobile traffic, and succeeding increments should correspond to appropriate types of commercial vehicle. These increments must recognize both the effect of wheel loads on structural design, and the effect on geometric design made by vehicle size, speed and power.

ROAD CLASSIFICATION

Because road design will vary with the use to which the road is to be put, a comprehensive incremental cost study should deal, in turn, with each of several road types selected on a functional basis. For practical reasons the number of road types must be kept to a minimum: say, rural land service, roads, county arterials, intercity highways, residential city streets, city arterials, and expressways. Normally, each of these road types will depend to a different degree upon user taxes. Consequently, the division of responsibility between car and truck is only a partial solution, and if my earlier remarks tended to over-emphasize the importance of the basic road concept, the excuse is to be found, here, in the importance of property tax support for some road types.

The selection of road types on a functional basis permits a reasonable estimate of the user's cost responsibility before applying the incremental procedure, and also facilitates tax scheduling at the various levels of government, because, in a general way, the classification of roads and streets into administrative systems has a functional basis.

TRUCK FEES

The application of incremental cost theory may end with the assignment of cost responsibility to each of the several vehicle types. However, the philosophy of incremental cost may properly be extended to influence the choice of methods for the collection of the incremental cost assignments. For example, if it is found that trucks of 10,000 to 20,000 lb. GVW should pay, as a class, \$500,000 per year, the question of collection still remains. Should each such truck pay the same annual fee, or should a mileage charge be assessed? It seems in line with the concept of incremental cost that those cost items which represent readiness to serve should be collected by equal annual assessments against each unit of the vehicle group, while those elements of cost which are proportional to frequency of load repetition or to density of traffic should be charged on a mileage basis. The fuel tax is the simplest device for this purpose, but more complicated procedures may be found necessary. Sometimes theory can be compromised to obtain a practical solution without any significant sacrifice of equity.

A mileage tax based upon those incremental cost items which are proportional to traffic density is quite different from a mileage tax based upon the ton-mile theory. The one is a charge for using-up the road, while the other is a charge for road use. The former charge is a joint-owner's share in the cost of construction or replacement, while the latter is a tenant's payment of rent. It is a major attraction of the incremental-cost theory that it recognizes each user to be responsible for his fair share of the cost of the road which, as a citizen, he owns in part. Alternative theories consider the user as a customer of the government, with fees based upon service rendered. Because costs are not necessarily proportional to service, only the incremental cost theory is aimed at what should be our ultimate objective - providing facilities that permit transportation of

people and of goods at minimum total cost. Road use will be influenced by road costs only to the extent that user fees reflect cost responsibility rather than some other unit of service.

An important quality of incremental cost theory is that it recognizes the unique character of highway transportation, and faces up to the problem directly rather than by some analogy. Analogies are useful in explanation but dangerous in argumentation. Thus, some say that operating a highway system is like running a business, and that since a businessman may prefer to borrow rather than to sell stock there is justification for a permanent highway debt. Such reasoning would overlook the fact that the highway user is a part-owner of the facility which he uses; and that business debt, in contrast, results from a decision to pay interest rather than to share profits by issuing more stock.

To say that a highway is like some competing privately-owned transportation agency and hence should be financed by a similar method of rate-making is again to miss the distinction between types of ownership. When highway user-owners each pay their fair share of the cost of the road, the standard of road improvement becomes subject to economic control; and the rates of competing agencies, in response to this competition, also become more closely geared to the cost of the service. Only through incremental cost can we automatically approach transportation at minimum total cost.

THE HIGHWAY COST ALLOCATION PROJECT IN WASHINGTON STATE

The current study of highway taxation in the state of Washington, under the auspices of the Washington State Council for Highway Research, includes the incremental approach, as well as several other theories, for the use of the State Legislature in its establishment of policy. The study was authorized by the 1953 Legislature, which directed that a study be made of "motor vehicle taxation, including the assignment of total highway costs among property owners, general taxpayers and highway users." The prospectus for the investigation was finally approved in December 1953, and work has been in progress throughout 1954. The final report will be available to the 1957 Legislature.

In planning this investigation, major reliance was placed on forthcoming data from current research by other agencies. These other projects include the WASHO test road at Malad, the Road Life Study, the Operating Cost Study, the Vehicle Use Study, and the Highway Needs Study. Most of the effort expended during 1954 has been in the collection of data not otherwise available in Washington State.

Bayard O. Wheeler, professor of general business, University of Washington, has been supervising analysis of the effect of limited access highways on suburban property values, based upon several thousand records of real estate sales before, during and after construction of the improved facility.

Stanley H. Brewer, associate professor of marketing and transportation, University of Washington, has under way an extensive study of intra-state commodity movements and competitive freight rates. Such information is needed for the estimation of the value of user benefits.

William L. Garrison, assistant professor of geography, University of Washington, is in charge of an analysis of highway benefits to rural property.

Martin I. Eksey, associate professor of civil engineering, University of Washington, has been organizing the incremental cost phase of the project.

Earl C. Hald, associate professor of economics, University of Washington, has been conducting an inquiry into the feasibility of bond financing for highway improvement.

Joseph W. McGuire, assistant professor of general business, University of Washington, has under way the collection and analysis of data needed for the ton-mile approach. At the present time questionnaires on car mileage and fuel consumption are being returned with car, truck and bus license renewals.

G. A. Riedesel, research engineer, State College of Washington, is currently conducting a classification of county roads and city streets, to supplement the classification of state highways which was completed in 1952.

Prior to the inception of the project, advice on the formulation of the prospectus was obtained from a board of consultants, composed of M. Earl Campbell, Harmer E. Davis

and Bertram H. Lindman. The Board will also be invited to review the findings and recommendations resulting from the study.

The chairman of the legislature's Interim Highway Committee also has appointed an advisory committee, composed of representatives of groups within the state having an economic interest in the construction and financing of highways; to guard against overlooking any relevant factor in the investigation, and to promote public understanding of the final report.