THE OBJECTIVE OF THE STATE-WIDE HIGHWAY PLANNING SURVEYS

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In the summer of 1935 the Bureau of Public Roads laid before all State highway departments a proposal that they join with it in the conduct of a series of related fact-finding studies designed to develop information needed as the basis for a sound program of future highway improvement. By recent Federal enactment provision had been made that permitted expenditure of not more than 1-1/2 percent of certain Federal appropriations and matching State funds to be used for such a purpose, and the Bureau proposed that advantage be taken of this provision, which was such as to permit the larger part of the cost to be met with Federal funds.

Several States responded favorably to the suggestion at once, and, in November 1935, the first work was begun in Pennsylvania, followed quickly by work in Ohio, Michigan, Illinois, Missouri, Kansas, and Iowa, and within the year, by the beginning of work in 40 States.

In proposing the studies the Bureau was moved by recognition of the fact that, in the improvement of the roads of the country, we have reached the end of a pioneer period. It

perceived that we are entering a second stage of development and that, in many respects, the policies and attitudes that have been adapted to the needs of the pioneer period would require modification to fit them to the altered conditions of the new stage. It was mainly to develop the exact information essential to such an adaptation of current highway policies and to the drawing of a clearer picture of further improvement needs that the studies were proposed, and it is these ends mainly that they are designed to serve. A secondary motive, also effective in determining the conduct of certain parts of the investigations, is the desire to replace with indubitable facts the mass of conflicting opinion and biased report that at present forms so large a part of the information upon which to base decisions in regard to the taxation and regulation of highway vehicles and traffic, and the coordination of highway transport with other forms of transportation.

Until recently the rural roads of the country have been treated in two principal and distinct categories for purposes of administration and improvement.

In the one group there has been a gradually increased mileage, now approximating 330,000, constituting the State and Federal-aid systems of main intercity highways. This has been improved under administration of the State highway departments, in part alone, and in part jointly with the Bureau of Public Roads, financed with State and Federal funds. The roads,

constituting these systems of main highways vary in proportion of the whole rural road mileage from State to State ranging from about 5 to 40 percent. Although only the roughest approximations have been hitherto possible, it is estimated that they serve from 50 to 70 percent of the whole rural highway traffic, measured in vehicle miles. These roads, by methods designed to hasten their improvement as a continuous system, have now been brought to a state that permits travel to all parts of the country with reasonable facility; but much remains to be done to make them truly adequate for the service they are called upon to render. In part the further improvement needed is that refinement deliberately deferred in favor of the accomplishment of more needed fundamental improvements over the whole system, and in part it has been occasioned by progressive change in the demand and needs of the traffic, especially by recent marked changed in the speed capacity of passenger automobiles.

In the other of the two principal groups of highways has remained the far larger balance of the whole rural road mileage, roughly estimated at 2,700,000 miles. This group, made up mainly of roads inferior in traffic importance to those of the first group, and consisting generally of roads of local service, has been improved to varying degrees in the various States under the administration of thousands of local governing authorities. Serving, in the aggregate, a roughly approximate 40 percent of the total rural vehicle mileage, these roads include sections that probably compare favorably in importance with parts of the main

system and, at the other extreme, thousands of miles on which the daily traffic can be tallied on the fingers of one hand, with a gradation between the two extremes ranging through all degrees of intermediate importance.

Because of the chaotic state of local government records it has been impossible to form any satisfactory conception of the adequacy of improvement of these roads as a body. It is little better than a guess that approximately a third of the total mileage has been improved to some degree; but whether and to what extent the improvement is satisfactory; and how much, if any, and what part of the whole is in need of further improvement have been questions wholly beyond the possibility of reasonable answer.

With few exceptions, from the beginning it has been the policy to devote to the improvement of the main highways the yield of the motor vehicle license fees and gasoline taxes and all Federal highway appropriations. From these sources there has come an assured and increasing revenue that has made possible an orderly progress of improvement through most of the past period. Real property taxes, at first furnishing a considerable part of the revenue appropriated, have been progressively withdrawn and now constitute a very unimportant, if any, part of the funds employed for main road improvement in all States.

For the local roads, property taxes have always, until lately, furnished the greater part of the revenue required; but as time has gone on motor vehicle and gasoline taxes have been slowly

but steadily transferred, in increasing amounts, for their improvement. And in recent years, by abrupt, and in most instances ill-considered action, the whole burden of local as well as main road improvement in several States has been shifted to the shoulders of the motor vehicle owner and gasoline taxpayer. Also, in parallel with the extension of the field of use of the motor vehicle revenues on the rural roads, there has been a similarly gradual increase in a portion of these revenues allotted for city street purposes.

The tendencies noted reached a climax during the depression, when there was not only a widespread abandonment of the effort to raise property taxes for road purposes, but a sharp incursion upon the motor vehicle and gasoline revenues with aim to divert them to various purposes foreign to road improvement, for which purposes also the property tax had proved a failing source of revenue supply. This latter tendency was halted by the penalty provisions included in the Hayden-Cartwright Act of 1934, but not before the effect of the diversions, together with other causes had imperiled the continuance of even the most essential highway operations. The situation was relieved - in some States in the nick of time - by the timely increase of Federal highway appropriations designed to promote employment during the period of the emergency.

What might have been a major catastrophe was thus temporarily averted; but as many of the causes that tended to precipitate it still remain, there is still occasion of grave concern for the future support of the highway program.

Although it appears to be far from generally realized, it must be apparent, upon any reasonable consideration of the situation, that the first obligation payable from whatever highway funds there may be in the future, must be the maintenance and imperative further improvement of the more important highways, already improved in varying degrees. This applies equally to all roads truly important as marked by their actual service, whether they have been improved by the major or lesser governments, and without regard to present arbitrary administrative classifications.

On roads of this kind there is much of further improvement urgently required. Because of the recent increase in the speed of which automobiles are capable there is need of a general easing of existing sharp curvature and a general lengthening of present restricted sight distances. Surfaces of low type, intended for temporary service, must be raised to the ultimately needed standards. There is widespread need of more liberal width on 2-lane roads, and a growing necessity for pavements providing more than two lanes. Devious alignment and indirect routing, the results of pioneer improvement on historic rights of way, and gradual intercity and intertown growth, are everywhere in need of correction; and the correction will necessarily involve an expenditure for right of way going far beyond past outlays for this purpose, especially in view of the greater widths now considered essential for protection from abutting property encroachment and for future pavement widening. There is probably a demonstrable need, even now, for the creation of a limited mileage of express

highways, and the need for such ultramodern facilities is likely to grow. And certainly there is not only a need, but a pronounced public demand for swift continuance of the program of railroad grade-crossing elimination, a program, that will doubtless have a mate in the future separation of grades at intersections of important highways.

These are the principal classes of further improvements required on the main highways. The need for them is expressed in most cases in the undeniable terms of safety and prime economic and social benefit. They constitute therefore, with maintenance of the existing capital investment, a first draft on future available revenues, and must be so treated. But, though the need is recognized in general, there is nowhere such an exact knowledge of the particular requirements as will be necessary for a prudent reservation of covering revenues. It is such an itemization of the further needs of the main highways that is one of the principal objects of the planning surveys; and in this connection the reference to main highways is intended to include the main trans-city arteries.

Beyond the financial requirements of the main and presently improved local highways, whatever residue there may be of future revenue advisably collectible for road purposes, will be available for the extension of some reasonable degree of improvement to an added part of the local road mileage, now unimproved. There is a strong and unlimited popular demand for such extension, but it is a demand that brings no positive promise of the means of payment.

Of the actual need, whether expressed in the narrower terms of transportation savings or the broader language of social desirability and national economic benefit, there is at present no objective measure.

These, then, are other objects of the planning surveys: First, to determine, by such objective tests as it may be feasible to apply, the relative economic and social services performed by all parts of the large mileage of roads not included in the present main highway system; and then, to determine how much of the more important parts of this mileage it will be possible to improve and maintain, within the limits of funds likely to be available for the purpose, after deduction of the essential support of the main highways from revenues that may safely be counted upon as collectible for all road purposes, continuously in the future. Observe that emphasis is placed upon a proper provision for the maintenance of what is built. This means, in this connection, not only the operations ordinarily classed as maintenance, but also the essential renewal and further improvement of the created road plant as progress of depreciation and obsolescence require it. Unless this future obligation is reckoned and provided for we may find eventually that we have created a larger investment than it will be comfortable to maintain. It must be constantly borne in mind that so long as we continue steadily to enlarge the initially improved mileage, there will be in the mileage improved a considerable part, of such youthful age as yet to have revealed only a part of its eventual cost of maintenance

and perpetuation. So, in determining how far it is wise to go in improving additional mileage of local roads, it is essential that we set off against such future annual revenues as may be expected the true and whole annual cost of the improved mileage, in which the costs of maintenance and renewal must be included in their eventual proportions.

This whole question of the desirable extent and location of future local road improvement is given added importance by the recent change in Federal policy that extends Federal aid for the construction of secondary and feeder roads. The Federal government will insist that the money it provides shall be expended where it will do the most good. And - particularly in view of the fact that neither the Federal government nor most of the States have yet provided directly for the maintenance of the roads to be thus improved - it is highly desirable that there be a full realization of the cost of such maintenance and a proper provision to meet it from some source.

In their bearing upon problems of the lesser roads the planning surveys are designed to reveal not only the relative importance of the roads and their true costs of improvement, not only the mileage that may be improved within limits of funds probably available, but also to answer questions of the future administrative control over such roads, and especially the sources from which the revenues necessary for their construction and maintenance may fairly be drawn, with due consideration of the benefits they afford.

As previously stated, there is in the surveys the secondary object of amassing facts essential for proper disposition of problems associated with the taxation of motor vehicles, the regulation of highway traffic, and the coordination of transportation over the roads with other forms of transportation.

The tendency to transfer a larger part of the cost of highways to those who, as users, benefit most directly from them, raises important questions as to the additional amount that may be extracted from such users as a body and, particularly, also the relative amounts of the whole road-user contribution that should be paid by operators of passenger automobiles and the various sizes of trucks and busses. There is desire to make this distribution of burden in reasonable relation to the highway cost entailed by the service of each class of vehicles. Accomplishment of this desire is defeated at present by a lack of acceptable basic information concerning the actual characteristics of the various classes of vehicles in relation to highway demand.

Nominal capacity classifications of motor trucks by manufacturers are known to give no clue to the loads carried by the vehicles in actual use; but what are these actual loads? Facts to be developed in the surveys will supply the answer.

Gross loads of vehicles do not determine the design or the cost of the highway structure. Wheel loads are the determining factors; but what are the customary maximum wheel loads of separable classes of vehicles? The surveys will supply a factual answer for this question also.

The mileage of roads that must be designed for use by heavy vehicles and the consequent effect of such heavy vehicles upon the magnitude of total highway cost depends upon a determination of the actual range of operation of such vehicles. What roads do they use, or are they likely to use in sufficient numbers to require an improvement consistent with such use? There is no present possibility of a factual answer to this question. The surveys will supply these facts; as they will, also, all other facts conceived to be necessary for a rational apportionment of any given total of vehicular taxation among the various classes of vehicles.

The existing hodgepodge of laws regulating the use of the highways is commonly deplored. Generally, there is lipservice to the need of uniformity as between States and of more rational adjustment of the regulations to the actual needs of highway protection and a proper and economic development of highway transportation, coordinated with other forms.

Effective action toward these ends is prevented mainly by an absence of acceptable facts. Among the studies included in the planning surveys there is definite provision to supply these needed facts with assurance beyond controversial refutation.

As the first essential to further highway-improving effort is a precise knowledge of the present extent and condition of the whole highway system, so an inventory is the first phase of the planning surveys. The inventory is conducted by driving over every mile of the rural road system as it exists on the ground. By odometer measurement the length of each section of road is being

determined and as to each a record is being made of the width and kind of surfacing present, the width of the grade, and right of way, the location, kind and size of drainage and other incidental structures, and the condition of road and structures, as to physical integrity and traffic serviceability.

On the main roads, where safe service of high-speed traffic is an imperative objective, the existing curvature and sight distances are being tested according to standards chosen as the minima essential for the service of definite maximum speeds, assumed to be 60 miles per hour in non-mountainous areas and 40 miles per hour in mountains.

Reasoning that 6 degrees is the limit of curvature safe for travel at 60 miles per hour in the presence of a maximum practicable superelevation of 1-1/4 inches per foot, all curves on the main highways in non-mountainous territory that exceed this limit are being located and measured. In mountainous terrain, with 40-mile speed as the criterion, there is similar location and measurement of curvature on the main highways exceeding 14 degrees.

With the same speeds in view, the inventory of the main highways also includes the location and measurement of all sight distances that, for any reason, are less than 1,000 feet in non-mountainous sections and 550 feet in the mountains. At all such restrictions the causes are being recorded, whether horizontal or vertical curvature, or other fixed or temporary obstruction.

Also on the main highways, where heavy trucks and trailers of relatively low hill-climbing ability are likely to be present in considerable numbers to hinder operation of passenger

automobiles at normal speeds, all grades of length exceeding 500 feet are being measured and recorded if in non-mountainous areas, they exceed 5 percent and, in mountains, 8 percent.

At all level crossings of railroads the existing physical conditions are being exactly recorded, including the angles and grades of the highway approach, the number of tracks and the clear view both ways along the railroad from the highway at various distances from the intersection, together with the character of view-obstructing bodies. When to these results of the inventory there is added later, as planned, a record of the highway traffic over each crossing, and, with the assured aid of the railroads, a record of the rail traffic and of the accidents that have occurred in the recent past at each and the consequences in injury and death and property damage - when all these facts are available for every railroad grade crossing, it should be possible, as it has not been heretofore, to measure the dimensions of the grade crossing problem and establish an order of priority in elimination consistent with factors of relative hazard and potential traffic delay.

Viewed as of great importance, especially for the determination of the relative utility of the local, land-serving roads, the inventory also includes the location of all farmhouses and homes, churches, schools, and places of business of all kinds in relation to the roads. When this exact information, concerning the distribution of the homes and business places in rural areas is plotted, as the purpose is, together with the location of all roads, distinguished by type and condition of improvement, and all railroads,

airways, and navigable streams, on large-scale maps of every county, there should result an invaluable aid to future highway planning, and also to public planning of every kind that requires an exact knowledge of the distribution of population and industry and the existing facilities of transportation.

As a second major department, the surveys embrace a variety of studies of the character and flow of traffic, of the kind generally included in traffic surveys, but extended for the first time beyond the main highways and covering as well and as intimately as possible the whole rural road system. The first use of these studies will be to establish the present relative traffic importance of all rural roads, and especially of all roads not included in the presently designated main road systems. On the basis of such information it will be for the first time possible to determine what selected portions of the whole road system serve any given percentage of the whole traffic movement, measured in vehicle-miles. Since, in the lower reaches of the scale of traffic importance there is certain to be a large road mileage that must be eliminated from any probable improvement program, the ability so to group the existing mileage into systems capable of serving various percentages of the whole traffic is an essential facility of program planning.

But the traffic studies will provide much beyond the mere count of traffic that will be useful toward both the highway planning and the other objectives of the surveys, i.e., the taxing and regulation of vehicles and traffic and the coordination of means of transportation.

Origin-and-destination studies of one type will provide the data necessary for the solution of recognized problems of highway relocation. Another type of origin-and-destimation study - more general in character - will bring out clearly such differences as there may be in the character of use of the main highways and the local roads.

If, as is generally supposed, the main highways serve usually a far-ranging traffic, that in considerable part spans State lines, and consists in predominant measure of a through movement between cities, these studies will establish that fact or whatever else may be the true character of the main road traffic.

If, as is also assumed, the traffic on the lesser roads is commonly of more local origin and to a large degree closely associated with service of the rural lands and property through which they pass, the origin-and-destination studies of this more general type will also establish that fact or whatever else may be the actual condition.

The purpose of these determinations lies in the necessity of making fair future distribution of the cost of the highways between urban and rural taxpayers and between road user and property tax sources - an object of such importance and yet so elusive, that it is considered necessary to approach it by another type of investigation, called the road-use study, that is classed generally with the financial group constituting the third major department of the surveys. These road-use studies

seek to accomplish the same benefit-evaluating ends by means of carefully weighted questioning of various elements of the population and classes of road users.

But, before passing to a brief concluding summary of the character and application of the financial investigations it is necessary to refer to the weight and commodity inquiries of the traffic group. Of these there are two principal kinds. One, that is conducted at many points on the main system with portable scales and on the local roads by methods of estimation, has the purpose of determining the range of vehicles of the various weight groups over the whole road system; the double object being the supply of information essential for road surface and subgrade design, and the determination of the relative responsibility of the several vehicle groups for the repayment of road costs. The other kind of weight study is conducted generally at a few permanent pit-scales, and is intended to fix with accuracy the true characteristics of various classes of vehicles; their weights and their related dimensions; the kinds of service in which they are engaged, whether private, contract, or common carrier; and a variety of other conditions of their use; all for the primary purpose of providing a better basis upon which to rear more rational systems of regulation and taxation. In both classes of weight study account is taken of the commodities transported, for consideration with the weights and recorded lengths of haul, in future efforts to promote a better coordination of all transportation facilities.

The financial studies, although last to be mentioned, are likely to be the first resort in the program-planning effort for which the present surveys are designed to supply the basis.

Their first purpose is to determine the full magnitude of the present financial provision for road and street purposes, and to reveal the existing relation between the sum of all highway revenues and expenditures and the grand total of all revenues of the States and their subdivisions for all purposes of government and public services. Because of the variety and large number of taxing jurisdictions neither of these basic facts is known in most States, and for the same reasons plus the inadequacy of many of the public records, the determination is everywhere difficult. Nevertheless, it is of such importance that the facts be made known, that all possible force is being put into the effort to discover them.

The total of present highway revenue and expenditure being determined as completely as possible, the next object of the financial studies is to classify the revenue according to source and the expenditure according to object; and then to discover the incidence of the revenue, as payable by various taxpaying groups, and the shares of the same groups in the benefits resulting from the expenditure.

The relation found to exist between total highway revenue and expenditure and all other revenues and expenditures, and a comparison of the highway figures of each State with those of other States on a per capita basis, will serve to indicate whether and to what extent it will be possible in the future to count upon a higher rate

of taxation and expenditure for highway purposes. The relation between the taxes paid by various groups and the benefits conferred upon such groups by the expenditures as made will determine whether the tax burden is equitably distributed at present and, if not, what changes are needed to effect a juster balance, particularly as between the payments of urban and rural residents, between motor vehicle taxpayers and taxpayers on property, and between residents of various sections and parts of the State. Special studies will be made to ascertain how nearly the present rates approach to the point of diminishing returns from all forms of taxes.

By such studies as these it is hoped to indicate the probable maximum financial support that will be available for highways in the future and the taxing measures that will most equitably distribute the burden of such support.

And, finally, by means of what are called the road life studies, an effort is being made to determine the economic life expectancy of various types of surfaces and other parts of the highway structure, and the amounts and trends of construction and maintenance costs, in order that the costs of projected future programs may be reduced to an annual basis for determination of their feasibility by comparison with the expected total of future annual revenue.

The surveys are being conducted in each State under the direct supervision of the State highway departments through organizations especially created for this purpose. The Bureau of Public Roads is assisting with advice and suggestions in the conduct of all of the

surveys. While the definite program of work thus far outlined is limited to a first acquisition of planning facts, it is the hope that the experience of the accelerated surveys will lead to the establishment of a permanent fact-finding and planning function in all State highway departments.