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nication - Highway Transport

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ECONOMIC FOUNDATION FOR FUTURE PROGRESS

It would be trite to the verge of mediocrity in opening the discussion of this subject before such an audience, to assert the great need of building the nation-wide development of highway transportation now going forward upon enduring economic principles, were the facts existing at this time of lesser import. A great building lifts its parapets high above its surroundings, and hundreds of people spend their working hours within, untroubled by the thought that their safety depends upon the foundation courses extending to the supporting rock many stories below the pavements. A great bridge casts its spans across a mighty river - an architectural and engineering triumph wrought from the materials of construction - yet only is it secure and enduring as are the foundations which reach out of sight far beneath the surface to the earth's strata which offers unchanging support. These things we accept almost as a matter of course, believing that such large undertakings have, as a prerequisite, undergone searching study and investigation to determine all of the factors which may exert an unfavorable or destroying influence, and that all of these have been properly guarded against in the design and construction adopted.

It is possible to comprehend something of the physical and financial undertaking involved in the completion of a great building or a great bridge, because each may be, as an entity, encompassed within the range of vision; but who can picture to himself adequately the immensity of the highway improvement demands which are now being made within the United States, to say nothing of those of the territorial possessions? No other nation has

ever undertaken to supply adequate transportation facilities to an area of over 3,000,000 square miles. France has an area of 212,654 square miles, Germany 203,780, while the borders of Texas alone enclose 202,398 square miles. Our States are empires in their extent, and the whole future of this nation will be largely modified and determined by the factor of transportation including in this sense all forms of interchange. What is true of the nation is equally true of the individual.

It would seem, therefore, that the following general statements should be given full weight in this discussion. First, there are no precedents from which we may accurately estimate the total cost of providing the necessary improved highways, but the financial aspects even now are so large as to demand the most careful and scientific policies which may be determined. As the costs accumulate from year to year the increasing demands upon the financial foundation will cause failure unless the government policies are properly determined and planned for that future.

Second, no reason can be offered not to plan well for the future, for we are yet near the beginning of highway building activity in its major sense. There are not the same uncertainties that confronted the railroad builders. The early railroads were built largely on the strength of prospective and to an extent problematic traffic. The highways are being built for a traffic already waiting.

Third, there are plenty of evidences that the taxpaying public is rapidly nearing the end of its ability or at least of its willingness to act further in the capacity of a shock absorber. Too many public enterprises have been saved from bankruptcy only by calling on the public treasuries for additional funds to wipe out the deficit between estimates and cost, between income and outgo. There is no reason why the highways should not be placed

in the self supporting class. They are not a luxury nor an incidental, but one of the indispensable facilities to the life in all phases of the nation and of the individual. The highways are possessed of a real earning capacity, and this must be recognized, collected, and credited to them.

There is difficulty in properly allocating the earnings of the highway between the different services which it performs. But this may be accomplished acceptably by fair and impartial study and investigation. Up to the present too many such studies have been made for the purpose of proving a pre-determined conclusion. The old adage to the effect that it is the exception that proves the rule might well have been founded upon the conditions existing in the highway transportation field. There are many contradictions which arise when an attempt is made to apply general statements to specific conditions. All the aspects of highway improvement are so modified by the particular and specific conditions of the locality, small or large, under consideration, that he who is wise will not make either general or dogmatic assertions predicated upon insufficient or circumscribed data. Many of these assertions which we have accepted as almost axiomatic, fall down as soon as examined in the light of real fact. For example, it has been accepted as a to-be-rigorously-observed tenet that highway bonds shall be issued for a shorter period than the life of the road. The Cumberland Pike, the first and only great national highway of the early days, was thrown open to traffic about 1818. Today, after a full century, that highway is still in existence, rehabilitated and carrying an ever increasing traffic. It is true that, due to the changes in overland transportation, there was a long period when this highway fell into disuse and disrepair, but today, with the surfacing repaired and rebuilt, the same road bed and most of the same waterway structures are continuing to carry

the traffic. The extension of this road from Baltimore to Cumberland, originally a State project, was resurfaced in recent years at a very nominal cost. This light surfacing was placed for horse-drawn vehicular traffic, but with continued maintenance, and from time to time necessary reconstruction, is now carrying heavy automotive traffic. Under the theory just mentioned, for how long a period would the bonds, had the road been so built, have been proper? Apparently the road is in better condition today than ever before.

Again, suppose that capital is borrowed to establish a business. The earnings are sufficient to pay the interest on the original investment, and also for the maintenance, enlargements and betterments of the plant. Its earning capacity grows larger, its physical condition improves. The original buildings may be worn out and the original machinery discarded, yet the physical value of the plant as a whole is greater than the value of the original plant, and its earnings are increasing annually. Is it an evidence of unsound financing that the owner has continued to carry the original investment using his earnings to maintain and increase the value of the plant by enlargements and betterments?

The term "permanent roads" is a fallacy which is responsible for more or less of the unsound theory which has been advanced with reference to bond issues. There are certain of the essentials of road construction, such as the road bed and drainage structures, that can be so built that the deterioration is so slow that they may be properly termed "permanent." Road surfaces of whatever type deteriorate. Maintenance should begin as soon as the surface is thrown open to traffic, and the higher the cost of the road, the more careful in detail should be the maintenance.

There is also the fallacy of the imposition of detailed and arbitrary legal limitations upon the character and weight of the loads which shall use the roads. Proper regulation within certain reasonable legal limits of the use of the roads is an administrative matter and should be so regarded. Even in a single State conditions vary to the extent that loadings which may be carried without deterioration of some road surfaces will inflict untold damage upon others. Yet under the average regulatory law which has been thus far made effective, the utility of the best roadways is not realized in the full, nor the safety of the lesser capacity roadways assured. Research in the field of the weight of loads that can be carried by different road surfaces is revealing very definite information. The influence of subgrade soils, of tire equipment, of the distribution of the loads to the wheels, of the speed and many other variables is too complex to be written into law. The seasonal variation alone in the carrying capacity of the road beds, due to moisture conditions, is one of the most serious of all the causes of road damage, and for this single reason the highway authorities must be given wide discretion in traffic regulation.

There is also the fundamental fallacy that has not yet been properly answered that Federal Aid for highway building partakes of the nature of a contribution from the richer States to those of lesser wealth, and that under the present distribution of Federal Aid some States suffer while others gain. Such a conception is altogether ill-founded. The only real question within the whole matter was settled by the adoption of the policy of Federal participation in highway improvement. The income of the Federal Government comes almost wholly from three sources - internal revenues, postal receipts and customs revenues. The miscellaneous receipts and revenues from other sources constitute a very small percentage of the total.

All of these major revenues are of a character which cannot be properly confined or allocated by States. The fact that these revenues are collected within certain States is not indicative of the source or production of the basic wealth which makes them possible. Likewise, many of the expenditures which absorb the greater percentage of the Federal income cannot be allocated by States, such as the expenditures for the legislative, judicial and executive branches of the Government, the maintenance of the Army and Navy, and other expenditures of a general nature. But the expenditures which can be allocated, such as those for postal service, public buildings, rivers and harbors, reclamation, pensions, highway building, all vary between the States as necessity demands, but the distribution of these expenditures among the States shows very closely the same percentage scale as the collection of the Federal income. The whole matter becomes one of the best division of Federal income between the different activities which the Government has undertaken as Federal responsibilities.

There are many other fallacies which must be cleared away before we can hope to reach sound conclusions as to far reaching permanent highway policies which will justify themselves over a long term of years. Our total expenditures for all highway purposes in the United States last year were approximately \$600,000,000. This is the maximum expenditure for any year, but even this rate will not satisfy within any reasonable period the demand for improved roads. In the development of rail transportation the building of the road bed precedes the establishment of the rolling stock. In the development of highway transportation the individuals composing the public have equipped themselves with rolling stock to the extent of more than 10,000,000 motor vehicles, to say nothing of the large numbers of horse-drawn vehicles in use, and the public as a whole has charged itself with the task

of providing the road bed. An examination of the progress in highway building over the past ten or twelve years indicates a very serious lag in the development of the road bed in comparison to the increase in the rolling stock. This lag is so serious that there is an insistent demand on the part of the very large body of owners that the providing of improved road beds shall be hastened. This demand in turn is followed, and properly so, because of the very large expenditures required, by the equally insistent question of who shall pay. There can be no question as to the service that highways render to the owner of the motor vehicle privately operated. In fact, the utility of the vehicle is to a large extent dependent upon the improved highway. There can be no question as to the service which is rendered by the highway to the operator of motor truck lines and motor bus lines. The granting of franchises should be followed by a real financial return. There can be no question that the improved highway serves the real property in the rural districts. There is, although more questions may be raised, a real service rendered by the rural highway to the property within the urban limits. Or, if more acceptable, to the people as a whole within the cities. For example, the recent report issued by the Port of New York Authority states that in the port district comprising within its area a population of nearly 6,000,000 people, over 4,000,000 tons of foodstuffs alone are required annually by the people of the district. This means an average of one half ton per person per year. All of the foodstuffs originate upon a highway, some place, and the nearer to the district that the perishable foodstuffs, such as garden truck, milk, eggs, butter, can be produced, and the more directly and quickly they can be transported from their point of origin, to these people, the cheaper will be the cost and the better will be the quality. Can there be any doubt as to the interest of the urban dweller in

the rural highways quite distinct from any direct use which he may make of them? Likewise, can there be any doubt of the real service which the highway renders rural property?

Under these four classes may be grouped the major services which are rendered by the highway, but these do not bear a constant relation to each other, nor does the highway maintain a constant relation to each of these. The truck gardener is more dependent upon improved highways than is the farmer who raises only annual crops.

Thus the relative share of the cost of highways may not remain constant, but it is difficult to harmonize with the tenets of fairness and equity any plan of financing which does not distribute some part of the cost to each of these four services.

A proper financial policy cannot be established unless there is functioning an efficient stable highway administration. For a single State the highway business is an enormous business undertaking. There can be no efficient administrative, engineering or financial policy, unless this business be kept free from partisan policies and the employment of personnel be determined by competency and service. This applies regardless of the unit that is under consideration. With the exception of a very few States, it is apparent that the major highway development for the next decade and probably longer, will be upon the so-called seven per cent system which is now being established under the requirements of the Federal Highway Act of November, 1921. Prior to this Act, however, many of the States had established State systems which will be largely, in many cases completely, absorbed in the seven per cent system. Thus, we have now on a national scale the inauguration of the first cardinal principle of efficient highway administration, - the classification of the roads into selected systems.



On the seven per cent system Federal and State funds will be concentrated until completion. This classification, recognizing with full credit the progress made by many of the States before the Federal enactment, is fundamental. Through its operation the roads of greatest importance are first improved and all work done is accumulative toward the completion of a system of inter-connected and correlated traffic lines as between the communities within the States and between the States themselves. As the highway systems are completed, the traffic will become more and more organized and concentrated on the improved roadways. If these systems are not properly selected, they will eventually have to be revised and so much of the investment jeopardized.

In sequence of importance is the proper improvement of the highways so selected. Up to a certain point the steps in the improvement of all types of roadways are the same. The selection of the best location, the building of the road bed by excavation, filling and draining, the building of the necessary culverts and bridges, the building of guard rails, approaches and all the incidental construction will be as carefully and thoroughly done under an efficient highway administration for all types of highways.

The selection of the type of roadway surface is the all important item from the standpoint of the highway service and highway finance policies.

Here are the average costs covering 11,017 miles of Federal Aid highways:

Class 1, including the graded and drained, the sand-clay and gravel types, average cost \$11,320;

Class 2, covering the macadams, waterbound and bituminous \$20,540;

Class 3, covering the bituminous concrete, Portland cement concrete and brick, \$56,100 per mile. Because, however, the average total cost of the Class 1 roadways is only one-third the average cost of Class 3 roadways, it does not follow that the Class 1 should be built to the exclusion of the other. The Class 3 roadways are capable of rendering many times the service the Class 1 types can support.

The service to be rendered must determine the selection of the type of highway. Here again research and investigational studies are rapidly fixing within reasonably definite limits the kind and volume of traffic which can be carried by the different roadway surfaces within reasonable maintenance costs. Such a selection will determine the proper financial policy, for it will provide the basis for the establishment of an annual highway expenditure budget.

The major items of the budget will include the following:

- a. Maintenance
- b. Reconstruction
- c. New construction

Reconstruction is included separately from maintenance for in the progress of highway improvement the replacement of old surfaces is usually by a higher type surface and consequently the road is improved beyond its first condition.

The budget for the State highway department would, of course, apply only to the State system which in general includes the seven per cent system. The estimates would determine the amount of revenue needed for the year's program for the different classes of work. The amounts needed for maintenance and reconstruction will be determined from the records and reports of the condition of roads in the system, for the administration of

the State highway systems has developed to the point where it is possible to estimate within reasonable limits the necessary annual maintenance and reconstruction requirements.

The new construction requirements in the majority of the States are capable of absorbing all the funds that can be made available, so it is in the fixing of this fund that the most care should be exercised, but it should be sufficient to complete the first construction of the State system within the shortest period consistent with good management and the maintenance of competitive prices.

The total amount as well as the division of the total between the three funds will vary in the different States, but it is believed that it will be possible to follow the same general principles to the raising of the total revenue required. It is freely admitted that these suggestions are tentative and subject to revision in keeping with the detailed studies which are now being made. Also the relation of urban expenditures and local expenditures for streets as well as rural roads not on the State systems must be given very careful thought. However, it appears more than probable that the State systems will be ultimately extended to provide a sufficient mileage of roads to take care of all the main highway transportation needs of the State.

With these qualifications, then, it is believed that a proper financial policy will require first that all of the maintenance funds be met from the revenues derived from the road user; second, that the costs of reconstruction be met from the revenues derived from both the road user and from State taxes, the relative percentages being different for different States and for the different types of roadways built; third, after deducting the Federal aid the cost of new construction should be divided

between the road users and other State taxes from both urban and road sources.

Just how the respective revenues for reconstruction and new construction shall be divided between revenues from the road users and other classes of revenues, and how these costs, once apportioned, shall be divided to the several classes of road users and the different classes contributing to the other revenues, must be determined upon the most thorough research and investigation. It has been stated that the total expenditures for rural highway purposes in the United States for the past year were approximately \$600,000,000. These revenues came from the following sources:

Federal Aid	14%
State road bonds	7%
State taxes and appropriations	12%
County, township and district taxes and assessments	14%
Motor vehicle revenues	19%

Federal aid and motor vehicle revenues constituted 33 per cent; the remaining 67 per cent either comes directly or will eventually be paid from State and local taxes. It is believed that a very considerable readjustment of these sources of revenues must be made, so that a larger percentage will be paid by the road user and a lesser percentage from State or local taxes. This statement of motor vehicle revenues is not fairly representative of the total funds collected directly or indirectly from the motor vehicles, for our estimates show the following revenues paid during the fiscal year 1921:

Federal taxes paid by manufacturers on passenger cars and motor trucks . . . . .	\$115,546,249
State registration fees . . . . .	122,478,654
Personal property taxes . . . . .	52,500,000
Wheel and privilege license . . . . .	3,636,543

Gasoline tax, 17 States, calendar year  
1922, estimated . . . . . \$11,000,000

A total of \$305,161,146, or approximately \$30 for each car and truck registered during 1921. This total sum, it will be noted, amounts to over one-half of the total estimated road expenditure for 1921.

Consider also in this connection the question of gasoline consumption. It is probable that the total gas consumption for use in operating automotive vehicles is not far short of four billion gallons per year. An advance of one cent in the price of gasoline on the annual consumption would amount to approximately \$40,000,000.

Facts as to the type of construction which is going into the road building program must also be given consideration. For over 11,000 miles of Federal Aid roads involving a total cost of over \$183,000,000, the surfacing cost is 60 per cent and the remaining 40 per cent is made up of grading 22 per cent, structures 14 per cent, shoulders 1 per cent, engineering 3 per cent. That is, 40 per cent of the expenditures were for the permanent features of the road and the greater part of the expenditures for surfacing can be rightfully considered in the same class, for it is being successfully demonstrated that by supplementary construction such as the placing of new surfaces, the widening by addition of shoulders, the greater part of the investment can be continually maintained and thus preserved indefinitely. Expenditures of this class fall into the category of maintenance and reconstruction, and if continuance of these two can be relied upon the original investment is preserved indefinitely. Therefore, little fault can be found with the soundness of the financing if bonds are issued for new construction if the original investment is thus continually preserved.

A few of the States have made large initial expenditures for construction on their principal highways. These States on their State systems will in the future require large sums for maintenance and reconstruction. The wholly new construction on the State systems will be completed within a few years. Other States have a large mileage of entirely new construction. In addition, the funds for maintenance of the system as a whole will be large, since the policy of taking over the entire State system for maintenance, regardless of its condition as to improvement, is being followed to a considerable extent. The results accomplished indicate that it will be necessary for the States generally to adopt this policy. It is evident, therefore, that the time is rapidly approaching when the principal demand for road funds in one group of States will be for maintenance and reconstruction, and in another group and by far the larger, for maintenance and new construction.

Of all these requirements it appears that the funds for the new construction in the amounts that will be needed, will be the most difficult to secure. The public should not be called upon to bear this entire cost as an annual expense. Rather is it fair to distribute these costs over a period of years extending beyond the time of the maximal expenditures for new construction. It is not doubtful that succeeding generations will enjoy the use of the highways which are being built now, and there is nothing unfair or to be criticized in pursuing a financial policy which distributes a portion of the cost beyond the immediate period. No enterprise requiring funds in the large amounts that they will be required for the new construction of highways can go forward without anticipation of revenues.

Experience in the administration of highway work has already established certain definite principles without the observance of which it would be highly unsafe to resort to bond issues. The major principles may be outlined as follows:

1. As a general proposition State, not local, bonds should be issued for the building of the State highway system. In any case the total amount of bonds to be issued for any one year or over a period of years in any State should be subject to the control of one central body.

2. Sufficient revenues must be derived from the users of the highways to pay all of the maintenance and a percentage of any reconstruction charges.

3. All bond built highways ought to be maintained under the direct supervision of the State Highway Department, which also must have jurisdiction of the revenues from the road users, and the proper maintenance of all bond built roads must be considered a first lien upon such revenues.

4. The proceeds of bonds must be devoted to a system of roads so devised that as the system is completed these roads will in fact continually serve the major traffic in the vicinity. This means that the only safe sequence of improvement is in the order that the different sections of the system serve the traffic.

5. Bonds should not be issued in an amount beyond the ability of the traffic of the present and immediate future to pay revenues sufficient for the proper maintenance of the roads built from the proceeds.

6. The type of roads built with bonds should be adjusted to the traffic which they will be called upon to bear within the reasonable future.

It will be noted that little has been said as to the uses which are to be made of the highways, but it must be remembered that the whole question

of highway transportation is in its infant stages. Very careful investigations and studies are now going forward to determine both the economic limitations of highway transport and of the necessarily adjusted highway construction. We have made rapid progress during the past two years toward such determination, and the suggestions which have been made are based upon an administration of a highway program predicated upon the results and determinations of these scientific researches and investigations. The science of highway administration is being rapidly developed, but the principles and information available must be given the widest publicity. It makes no difference how sound a policy may be adopted by one administration. The work of providing a road bed for the rolling stock now in existence will extend over more than a decade into the future, and it will lie with the public to determine whether the policies shall be carried out or whether there shall be a change with every change in the complexion of the administration. This is the most uncertain feature of any connected with the financing of road improvements, particularly where it is desirable to issue bonds for a long period. If permanent policies can be adopted and carried forward without change over a period of years, the necessary roads can be built without undue burdens upon the public. But only can this be done by foreseeing now and adhering to safe and sound financial policies. The objective, after all, is to furnish the cheapest possible highway transportation, which involves both the rolling stock and the road bed. But the public have undertaken to provide the road bed as a public responsibility, and there should be no misunderstanding of the huge sums which are involved in the undertaking.