



**AgEcon** SEARCH

RESEARCH IN AGRICULTURAL & APPLIED ECONOMICS

*The World's Largest Open Access Agricultural & Applied Economics Digital Library*

**This document is discoverable and free to researchers across the globe due to the work of AgEcon Search.**

**Help ensure our sustainability.**

Give to AgEcon Search

AgEcon Search

<http://ageconsearch.umn.edu>

[aesearch@umn.edu](mailto:aesearch@umn.edu)

*Papers downloaded from **AgEcon Search** may be used for non-commercial purposes and personal study only. No other use, including posting to another Internet site, is permitted without permission from the copyright owner (not AgEcon Search), or as allowed under the provisions of Fair Use, U.S. Copyright Act, Title 17 U.S.C.*

*No endorsement of AgEcon Search or its fundraising activities by the author(s) of the following work or their employer(s) is intended or implied.*

Annual Meeting, American Association of State Highway Officials,  
San Antonio, Texas -- November 12, 1929.

## FINANCING HIGHWAYS

by

Thos. H. MacDonald  
Chief, U.S. Bureau of Public Roads

The acid test of a sound highway financing policy is its ability to support with unbroken continuity the two essentials of a successful highway program - the perfect maintenance of existing highways and a reasonable annual expansion of modern highway construction. There is no clean cut line of division between highway financing, highway administration, and highway engineering technique. Each is so intimately related to and dependent upon the other two that they stand, succeed, or fail together.

Public financing, particularly the financing of public works, is of an entirely different character than private financing and much confusion has existed in the public's mind from this fact. The average banking executive, grown wary through contact with relatively short lived corporations and shorter lived individuals, lacks the imagination, initiative, and experience to plan successful financing of a large and long continuing highway improvement financial policy. Formerly there had to be reliance

solely upon faith in the profitableness of highway improvement to induce the undertaking of large expenditures. Now there is needed only a knowledge of results actually secured where faith earlier provided for an extensive program of highway development. No country in the world however, as yet, possesses adequate highways - that is, highway mileage in the amount and of the character of improvement that will be profitable to provide. Most of the nations considering their whole extent and needs, certainly those of the Western Continent, have as yet made scarcely more than a beginning toward a really adequate highway system. There is a slow turning from the old bugaboos and fears of disaster through large public expenditures for highways, and a growing recognition of facts which give confidence in such a policy. Full confidence is justified if a major part of the annual expenditure adds to the permanent investment, if the necessary taxes on property are so reasonable the public is willing to continue them indefinitely, and if the taxes upon the road user are so moderate they do not discourage expansion in the utilization of highway transport.

Since the inevitable result of such policies is an accelerated growth in highway traffic, financial policies must be flexible. Without recourse constantly to legislation the income must automatically increase with the expansion in the use of the highways and the road funds must receive the increase in earnings due to previous expenditures.

For the five year period - 1923-1928 - the total funds for rural highways have averaged over \$1,300,000,000 annually. There has been a rather uniform rate of increase and it is probable the total expenditure will continue to increase slowly. There has been a marked change, however, in the relative percentages of income from the various sources. While in 1923 the income from the highway user was only 19.7 per cent of the total, - in 1928, after an increase in the total expenditure of 68 per cent, the percentage paid by the road user in motor vehicle license fees and gas taxes constituted 35.4 per cent of the whole, a most convincing demonstration of the earning capacity of improved highways to produce a direct income.

The relative place of rural highway expenditures in the business of government is modest. Of the total income for all government purposes, 15 per cent is used for highways. Activities which require higher expenditures are government itself, education, national defense, and the old debts of war.

Much debate has revolved around the matter of road bonds. While in a few of the states there is not the same urge of necessity that existed a few years ago, yet today every state could issue bonds profitably either for primary road building or some of the integral or auxiliary construction needed, such as grade crossing elimination, by-passing traffic congestion and continuous

flow routes, that is, routes without cross traffic hazards and interruptions. That the issuance of bonds is an income producing measure is denied and will no doubt be vigorously contested. Nevertheless, intelligently and scientifically adjusted to the needs of the particular state, the issuance of road bonds affords the only way that public credit can be exchanged for physical properties, improved roads, which are income producing and which do have the ability to pay for themselves. There is not a single valid argument against the issuance of bonds for road improvement as a fiscal matter. It is possible for those seeking public office to secure votes against bonds by capitalizing old prejudices and the characteristic human fear of debt. Certainly in the face of the experience of the states which have made the most rapid progress in road improvement and which have advanced a part of the costs from bonds, there is not a single unfavorable situation or circumstance to support anti-bond arguments. Many of the anti arguments wholly false and wholly unsound economically have nevertheless an appeal so widespread and so ready an acceptance that they may be met only by the most careful survey and analysis of the highway needs, the probable future growth of use and the possible revenues from all sources, and all combined in a fiscal and improvement plan that takes the public into full confidence. Only when the confidence and support of the public are secured, and it must be remembered this confidence has been

more than once given and betrayed, can there be any hope of the necessary continuity of an adequate fiscal policy. Continuity is here made a major consideration for two important reasons -

A sound fiscal plan must be self perpetuating. Since there can be no fixed time when new construction will end, the expected income must provide always a reasonable sum above fixed commitments such as maintenance, bond interest and retirement, and administration costs. This automatically limits the bond principal plus interest which may be retired per year, and with the term of years or life period of the bonds determines the total size of the issue.

The second reason is negative. Any fiscal policy which throws a heavier burden back upon itself and accumulates obligation is not sound and cannot be continuous. These results inevitably follow the borrowing of county funds by the state for state road purposes. Once the state has assumed the responsibility for laying out and improving a state road system, the use of county funds and county or other local credit should cease. Such a policy is always more costly and much less efficient. There are now instances of such wastefulness springing from this general cause that the excess and wholly unnecessary cost will equal or exceed the value of the work secured.

Before attempting to devise a rational plan of highway finance, we should have a clear understanding of the magnitude of the task of highway improvement and a knowledge of what has

been and is being done to finance the improvement. I shall try, therefore, to picture the problem from both angles, omitting as much as possible of the complicating details and drawing only the lines that are necessary to an appreciation of the general form.

First let us examine the proportions of the physical job. We find that there are approximately 3,016,000 miles of public rural roads in the United States. Of this total, in 1928, there were 306,000 miles that were included in the State highway systems and 2,710,000 miles were under the jurisdiction of county and other local officials.

In 1921, the year of the passage of the Federal Highway Act, the State systems included only 203,000 miles, which was practically equivalent to 7 per cent of the existing total mileage, the limit that was established for the original Federal-aid system. Since 1921 there have been taken into the State systems an additional 103,000 miles, and the extent of these systems at the beginning of the present year was 10.2 per cent of the total road mileage.

The proportions of the State highway program have thus been increased by 50 per cent in a period of seven years, the annual addition averaging nearly 15,000 miles. In this period of seven years only three States have failed to increase the mileage of their State systems; eleven have added less than 500 miles; nine have added between 500 and 1,000 miles, seven have added between

1,000 and 2,000 miles; ten have added between 2,000 and 5,000 miles; and eight have increased the size of their systems by more than 5,000 miles.

The percentage of the entire road system embraced within the State system on December 31, 1928, varied from a minimum of 5 to a maximum of 36; the minimum in Oklahoma and South Dakota, the maximum in Rhode Island. Of the three States that have made no additions to their systems, two, Missouri and Oklahoma, still include considerably less than the average percentage of the total mileage; the third, Vermont, has a system which includes 28 per cent of the total road mileage, next to Rhode Island the highest percentage in any State.

Of the eight States that have added more than 5,000 miles in the seven-year period, two - Illinois and Kansas - still include less than the average of 10.2 per cent, the former 10.1 and the latter only 6.7 per cent. Three of this group - Arkansas, Mississippi, and Montana - still include only slightly more than the average percentage, the figures varying from 11.7 to 12.2 per cent. The other three - Kentucky, Louisiana, and New York - by their large additions have increased their respective ratios of State system to total mileage to 18.7, 27.3, and 17.5 per cent, respectively.

Additions to the State highway systems have been made either by legislative enactment or by action of the State highway departments under authority vested in them by the legislatures. There

can certainly be no reasonable objection to the placing of a greater mileage of the more important roads under the supervision of the State agencies; on the contrary, such transfer from local control is distinctly desirable and must eventually be made. But addition to the State program without corresponding increase of State revenue is not likely to produce a satisfactory result and is decidedly unfair to the State agency which must shoulder the responsibility.

That is precisely what has been done in too many instances; and a study of the mileage and condition of all of the State systems in conjunction with the revenues available for their improvement and the demand for improvement as indicated by the motor vehicle registration, must lead to the inevitable conclusion that expediency and enthusiasm have been more influential than sound reason in determining the program of State improvement.

Certainly, when we find two adjoining States of similar area, road mileage, and motor vehicle registration; one with nearly 19 per cent of its total mileage in the State system of which but 45 per cent is surfaced and revenue which will permit an expenditure equivalent to only \$1,200 per mile of the system; and the other with only 9 per cent of its road mileage in the State system of which nearly 80 per cent has been surfaced and annual expenditures equivalent to nearly \$3,300 per mile of the system; certainly with these facts

before us we are justified in concluding that reasons other than those of sound business economics have been responsible for the difference.

To complete the picture of the physical problem, let us add that of the 306,000 miles in the State systems in 1928, over 113,000 miles, or 37 per cent, were still unsurfaced; 125,000 miles, or 41 per cent, were surfaced with sand-clay, gravel, or macadam; and 68,000 miles, or 22 per cent, were improved with surfaces of bituminous macadam or better. In 1921, of the 203,000 miles then included in the State systems, only 41 per cent was surfaced. In 1928, we find surfaced 33 per cent of the 306,000 miles to which the systems of the States had grown. But there still remains unsurfaced 113,000 miles, or almost as much as the 118,500 miles that were unsurfaced in 1921.

When it is considered that there were 78 motor vehicles for every mile of the enlarged State systems in 1928 and only 50 in 1921 for each mile of the smaller systems, it will be appreciated that the job of the States is still far from finished.

Of the 2,710,000 miles of local roads, 433,000 miles or 16 per cent had been surfaced by the end of last year; but of this surfaced mileage only a little over 34,000 miles, or 8 per cent, was of bituminous macadam or better, a figure that may be compared with the 22 per cent of similar improvements in the State highway systems.

Viewing the roads of the country as a whole, we find that at the end of the year 1928 there was a total surfaced mileage of 326,000 miles of which 193,000, or 30 per cent, were in the State systems; and that of the surfaced total 102,500 miles, or about 16 per cent were improved with surfaces of bituminous macadam or better. Of the surfaces of this higher class, 36 per cent were in the State systems.

Turning now to the financial aspect, we find first that the total expenditure for the improvement of rural roads in 1928 was, in round figures, \$1,660,000,000 of which \$828,000,000 was expended by the State highway departments and \$832,000,000 by county and other local authorities.

To defray these costs there was available to both State and local authorities income which in varying amounts was derived from the same three general sources; namely, taxes on real property, taxes on motor vehicles and their fuel, and the sale of bonds and notes. In addition, the States drew a portion of their income from Federal aid. A portion of the income drawn from these sources by the States was transferred to the counties and other local units. A portion collected by the local authorities was transferred to the States. Of these transfers it is difficult to ascertain the original source. There are also certain

amounts derived by appropriation and certain miscellaneous items the source of which is not entirely clear, but these may be considered as coming in the main from the taxation of property.

With this explanation it is possible to classify the \$849,000,000 of income to the States in 1928 approximately as follows:

From the sale of bonds and notes, 14.3 per cent; from property taxes, 7.9 per cent; from motor vehicle fees, 30.5 per cent; from gasoline taxes 27.6 per cent; from funds transferred by local authorities 10.2 per cent; and from Federal aid 9.5 per cent.

The income of \$835,000,000 accruing for local road purposes in 1928 may be similarly classified as follows:

From the sale of bonds and notes, 18.0 per cent; from property taxes 65.9 per cent; from motor vehicle fees, 6.0 per cent; from gasoline taxes, 6.4 per cent; and from funds transferred by the States 3.7 per cent.

The income of the States, now \$849,000,000, was in 1923 only \$467,500,000 but little more than half the present sum. Of the smaller sum collected in the earlier year the several sources contributed as follows:

Bonds and notes	18.9 per cent
Property taxes	16.5 per cent
Motor vehicle fees	31.4 per cent
Gasoline taxes	3.4 per cent
Transfers from local units	14.3 per cent
Federal aid	15.5 per cent
Total	<u>100.0 per cent</u>

From such an analysis several pertinent facts appear. First, with respect to State highways it is evident that the major source of income is taxation of the motor vehicle and its fuel. The sum of \$493,000,000, or 58.1 per cent of the total State highway income was allotted from these sources to the States in 1928. Five years previously the same sources contributed to the State highways only \$133,000,000; and the increase in revenue from these sources alone, amounting as it does to \$330,000,000 for the year, accounts for nearly all of the increase of \$361,800,000 in annual State highway revenue during this 5-year period.

Of the total revenue collected in 1928 from motor vehicle fees and gasoline taxes, a portion was used to defray the expense of collection and administration, a portion was allotted to county and local road purposes, and various portions were devoted to purposes other than rural highway improvement, principally to schools and city streets. If all of this revenue, after deducting the collection and administrative costs, had been devoted to the improvement of State highways, the total of \$612,000,000 would have paid three-fourths of the State highway bill of 1928.

It should be noted here, however, that the trend in the use of these funds is not toward their concentration upon State highways but rather in the opposite direction. In 1921 local highway authorities received 23 per cent of the motor vehicle fees allotted to highway

purposes. In 1928 the same authorities received 28 per cent of the sum allotted to highways, and the trend in the intervening period has been more or less steadily upward. In 1928 there were allotments from the gasoline tax revenues to purposes foreign to rural highways of some 6 per cent of the total collections, and there is active demand particularly by the cities for the diversion of far greater sums from this source to city streets.

A second fact that stands out from the analysis of the 1928 highway income is that the States depend to only a small extent upon property taxes for the support of State road improvement. It may be assumed that the 7.9 per cent of the total State revenue drawn from this source is fairly representative of the general benefit derived by all property owners from the improvement of the State systems. The counties on the other hand, obtain from this source nearly two-thirds of their total income.

It is interesting to note that the States receive from the counties and other local units on the one hand and from the Federal Government on the other substantially the same amounts and percentages of their total income. Since 1923 the amounts received from the two sources have varied but slightly and have constituted steadily decreasing percentages of the State income as the motor vehicle revenues have increased in amount. In 1923 the sum received from the local units was 14.3 per cent of the total receipts of the

States; that received from the Federal Government was 15.5 per cent of the total. In 1928 the receipts from local units were 10.2 per cent of the total and Federal aid had dropped in relative importance to 9.5 per cent of the total State income.

The item to which I wish to direct your special attention, however, is the portion of this highway income, State and local, that is derived from the sale of bonds and notes. Of the total State income in 1928 the sum derived from this source was 14.3 per cent. In 1923 the corresponding percentage was 18.9, and the trend in subsequent years has been generally downward to the present level. The 1928 percentage represents an actual sum of approximately \$121,500,000 drawn by the States from this source, which may be compared with the sum of \$150,200,000, or 18 per cent of the total local highway revenue raised by the sale of bonds in the same year.

We have heard so frequently the solemn warning to "pay as you go", and so often have we listened to the tale of woe that impends for those profligate commonwealths that issue bonds, that I fear we may come to believe that there is something peculiarly virtuous in the direct investment of current revenue, and something unspeakably vile in the capitalization of income to create facilities capable of producing greater income.

When fanatical advocates of the pay-as-you-go plan utter their dire prophecies of the disaster that must follow upon the heels of a borrowing policy, I am constrained to doubt by the

knowledge of the remarkable benefits that have attended that policy in the States that have made the greatest advances in the improvement of their highways. These gentlemen would have us believe that there are certain commonwealths whose people, preserving the ancient American ideals of honesty and frugality, rigidly refrain from the borrowing of capital for road improvement as a matter of principle. To believe them is to believe that these homely ideals continue to reside in just one of our 48 States, for there is just one - the State of North Dakota - in which thus far there has been no resort to bond issues either for State or local road improvement. If State bond issues alone are immoral, then there are 17 sovereign States that are free of taint, but the other 31 stand convicted by their records.

"Neither a borrower nor a lender be", runs the old adage. It is the rule of finance to which the pay-as-you-go advocate would have us adhere; but if it is really an economic sin to borrow capital for public works, then it must be none the less sinful when the borrowing is done by counties than when it is done by States. To fix the measure of guilt that is to be attributed to the people of each one of 47 guilty States, therefore, we must examine the borrowing record of both the counties and the States. Suppose we do so.

We find, as I have said, that there are 31 States which at some time or other between 1894 and 1928 authorized and issued State highway and bridge bonds. The total of such authorized issues is

\$1,391,216,500; but the total thus far issued, including refunding securities, is \$996,226,100, and of this amount there had been retired by the end of the fiscal year 1928, \$103,746,670, leaving an outstanding indebtedness of \$892,479,430. The fact that there were sinking fund accruals which would still further reduce the debt by over \$83,000,000 is scarcely worth mentioning; but I should like to point out in passing that this State Highway debt of the 31 States is approximately equivalent to one year's expenditure for State highways by all of the States.

Now let us examine the record of the counties and other local units of government. We have no complete record of the bonds authorized; nor have we a compilation of any sort of later date than 1926. For that year we have a record of the county and local highway and bridge bonds then outstanding, and the total in 45 States was \$1,386,338,683, a total 55 per cent greater than the outstanding State debt in 1926. In only three States was there no outstanding local debt for highways or bridges. They were New Hampshire, Vermont, and North Dakota, and only the last was also free of State indebtedness.

If as we are frequently told there are States the people of which refuse as a matter of principle to incur a public debt, then presumably we should find them among the 17 that have thus far incurred no State debt. We already know that in all but one of these

there have been issues of local bonds; but perhaps there have been mere occasional lapses from rectitude. Let us see.

What we find on examining the record further is that in these 17 States that have issued no State bonds the outstanding local issues in 1926 amounted to \$657,072,787; and that the issues outstanding at the same time in the other 31 States amounted to \$729,265,896. In the 17 States there are 1,354,500 miles of local roads; in the 31 there are 1,355,300 miles of corresponding class. The outstanding local bond issues in the 17 that have issued no State bonds amounted, therefore, to \$485 per mile of local road; those outstanding in the other 31 States of less conservative State policy amount to \$540 per mile of local road. If, therefore, it is true that the people of the 17 States do object to the issuance of State bonds, it appears that their objection does not extend to the issuance of county and local bonds. Perhaps they hope to be forgiven of their sin by the payment of the higher rate of interest.

Since there is really so much of this bonding by local units of government even in States that have refrained as States, the only way in which we shall see clearly the extent to which the practice is indulged in, is by throwing together the debt of the States and the local units in the States in which both have borrowed. Then if we also lump together the existing mileage of improved roads built by

the States and local units we shall see what the people of these two groups of States have gotten for their more or less reckless borrowing.

We find that the people of the 17 States that have issued no State bonds have 32,066 miles of roads improved with surfaces of bituminous macadam or better to show for their total debt of \$657,072,787. For each mile of such high-type roads, there is or was in 1926 an outstanding indebtedness of \$20,500 per mile, on every dollar of which they are paying a relatively high rate of interest.

The people of the other 31 States have a combined State and county indebtedness (ignoring the different dates of the records) of \$1,621,745,426, to show for which they have 70,493 miles of roads with surfaces equal to or better than bituminous macadam. The indebtedness is at the rate of \$23,000 per mile of such high-type roads; and on more than half of it the people are paying a minimum rate of interest.

If it be preferable to compare the debts of these two groups of States on the basis of their total surfaced mileage rather than simply the mileage of high-type surfaces, it is necessary to consider that the improvements in the 31 States are of distinctly higher average type than those of the 17 States. In order to arrive at an average appraisal per mile, it is necessary to apply some uniform

scale of value to the known mileages of each type of improvement in each group of States. As to this scale, ideas may differ; but for purposes of illustration we may adopt the following as representing the average capital investment in a mile of the several common types:

<u>Type</u>	<u>Investment per mile</u>
Sand-clay	\$ 8,000
Gravel	10,000
Macadam	15,000
Bituminous macadam	25,000
Bituminous concrete	30,000
Concrete	35,000
Brick	40,000

Applying this scale we find that the average investment in each mile, of the 296,056 miles of State and local surfaced roads in the group of 17 States, is \$12,500 and against each mile there is an average debt of \$2,220. In the group of 31 States the average investment in each mile of the 330,081 miles of State and local surfaced roads is \$15,000, and against each of these miles there is a combined State and local debt of \$4,915. The difference in the indebtedness approximately equals the difference in investment.

Let us now consider the county and local income alone in these two groups of States. We find that the totals for the two groups differ by less than 20 million dollars, being \$446,200,000 approximately in the group of 17 States that have no State bonds, and \$435,000,000 in the group of 31 States that have issued State

bonds. The figures are for 1928. When we look to the proportion of this income that was derived from the sale of bonds, we find that in the group of 17 States it was 23 per cent and in the group of 31 it was 15 per cent of the total. In other words, the people who are supposed to oppose bond issues are actually issuing high-interest local bonds in considerably greater proportion to their total local highway income than the people who presumably favor the issuance of bonds.

One more comparison and I am through with these interesting groups of States. I have referred to the transfers of income that take place annually between the States and their local units of government. In the large majority of the States, it works both ways. The counties and townships give and receive. The States receive and give. But apparently the local units are generally convinced that it is more blessed to give than to receive. At any rate, the fact is that 33 of the States actually do receive from their local units more than they give in return.

Of the group of 17 States, all but three are net beneficiaries by this practice, and the net gain to the States of this group is approximately \$59,200,000. Of the group of 31 States, 20 are similarly benefited by the interchange, although in smaller amount than their 17 sisters. In this group, the net gain to the States is roundly \$16,700,000. Of special interest here is the fact that the gain to

the 17 States is 21 per cent of their total State income, and the profit of the 31 States is but 3 per cent of their total income.

The motor vehicle fees and gasoline taxes turned over to the counties are not considered in the foregoing analysis as transfers from the States. Though they are in fact collected by the States they are presumed to belong to the counties by law. However, when we analyze the amount of these returns in the two groups of States, we find that the counties of the group of 17 States get approximately \$52,000,000 of a total of \$219,700,000 available for highway purposes, and those of the group of 31 States get practically the same amount from a total of \$377,800,000. In other words the counties in the group of 17 States get 24 per cent of the total and those of the 31 States get only 14 per cent.

I submit that it all comes down to this:

That it is generally true that the States that do not issue State bonds for highway purposes return to the counties a greater proportion of the motor vehicle revenues which the counties use to borrow money at high rates of interest in order to help the State eke out their deficient debt-free income.

I do not wish to be understood as favoring the issuance of bonds under all circumstances. I have said that I believe there are a few States in which there is no longer the need that existed

a few years ago for the employment of this method of financing. But I also repeat that every State can still profitably issue bonds for certain purposes, if not for primary highway building, then for grade crossing elimination, or needed bridges, or the provision of additional facilities for the relief of traffic congestion, or for any of the numerous improvements which remain to be accomplished in order to raise the efficiency of highway service to the desirable ultimate.

The outstanding advantage of the bond issue plan may be briefly stated as follows:

1. A rational system of roads economically in need of improvement may be planned and their improvement pushed to completion as rapidly as the physical limitations of plant, equipment, labor and materials will permit.
2. Present low current income may be capitalized for the creation of income producing facilities which share the payment.
3. The improved roads are built in a minimum time and vehicle operating cost savings are realized sooner than they would be under the pay-as-you-go plan.
4. Payment is more equitably divided between present and future users.

5. Savings in cost of construction are made through ability to let large contracts.
6. The roads produce wealth immediately in excess of the debt they create.
7. Maintenance costs are lowered.

But what of the actual dollars and cents cost of the two methods? If we borrow money we must pay interest. Consequently we pay considerably more than a dollar for every dollar obtained for road construction. Would it not be better to pay the cost directly and so save the additional cost of borrowing? If, without undue burden of taxation the roads can be built as rapidly as it is possible to build them, the answer is "yes". If road service is already reasonably efficient and economical transportation is already provided for in large degree, the answer is "yes". But these conditions obtain in few of our States.

To illustrate the relative costs of construction by the two methods of financing, and at the same time to show why it is sound economics to pay the additional cost of the bond method in order to speed up construction, let me cite an example based on an actual bond issue, the \$60,000,000 issue voted in Illinois in 1918. The interest rate on these bonds is 4 per cent. Payment of interest began in 1922. Retirement began in 1926. It is planned to complete retirement in 1944 and on this basis the total interest

payment will be \$33,200,000. For each dollar borrowed the State will pay \$1.55. The bond issue sold for \$58,496,978 in the years 1921 to 1924 inclusive. The roads built average \$39,384 per mile, and the money realized paid for 1,480 miles which were completed by 1925. Amortization is spread over a period of 23 years, making an average annual payment of \$4,052,200.

Now let us suppose that instead of issuing the bonds this same average annual sum had been used to pay for these roads directly. It would then have taken 15 years to complete the roads which under the bond plan were completed in 5 years. In other words, the 1,480 miles of road were available for an average period of 5 years under the bond plan before they would have been available under the pay-as-you-go plan.

So much is actual fact. Now we must make one or two assumptions. We will make them conservatively. We must estimate the number of vehicles these 1,480 miles of paved road would serve for the period of 5 years and the saving in operating cost that would be returned to the operators of these vehicles by the availability of the improved roads. Let us estimate that each mile of these roads will be used every day of the 5 years by an average of only 1,000 vehicles and that the saving to the owners of these vehicles is  $1\frac{1}{2}$  cents per mile. Both of these estimates will be considered, I believe, as sufficiently conservative. The result is an estimated

saving of \$40,515,000 in operating cost over the 5 year period, by which improved highway service has been advanced, which exceeds the interest cost on the bond issue by \$7,315,000.

There is still more to be said about this bond issue. It was financed exclusively with motor vehicle revenues, and no increase in the rate of motor vehicle taxation was permitted. In 1921, when the first bonds were sold, receipts of motor vehicle revenues amounted to \$6,803,556. In 1928, seven years later, annual receipts had increased to \$15,521,530. In other words, the personal liability of the motor vehicle owners who assumed the debt in 1921 was cut in half by 1928.

The use of motor vehicle revenues to finance bond issues dates from 1913. Prior to that year all issues of State highway bonds were financed from the proceeds of general property taxes. In 1913, Maine began to issue bonds at the rate of \$500,000 a year for highway purposes, the issues to be financed from the proceeds of the motor vehicle tax. The procedure, which came to be known as the "Maine plan", proved its soundness in practice, and other States were quick to adopt it. As a result we find that of all issues authorized between 1894 and 1928, totaling \$1,391,716,500, the sum of \$670,374,000 is being financed either from motor vehicle fees or gasoline taxes, or both. Of the remainder, \$14,500,000 are being financed from bridge tolls, and \$706,842,500 from general State

revenues. Of this latter amount, \$300,000,000 is the amount of the New York issue for grade separation purposes, and of the balance of \$405,842,500, half was authorized and issued prior to 1919, when the first gasoline tax measure was adopted.

There can be no question that the employment of motor vehicle revenues to pay for bonds is now the proper procedure.

There is one other question that must be answered to round out a fairly complete picture of the sources of highway income and the present status of highway finance. That is the question as to the relative contributions of those who live in cities and those who live in the country. The statistics which would permit of a complete answer have not been found, but facts are available which are strongly indicative. The current revenue for highway purposes comes from just three principal sources; namely, the Federal Treasury, taxes on real and personal property and taxes on motor vehicles and their fuel. The Federal contribution may here be ignored. It is relatively small and is presumably spread quite generally over the entire population.

As to the contribution of the motor vehicles, we find that according to the estimates compiled by the Farm Journal, the only existing source, 5,427,000 of the 24,493,000 motor vehicles registered in 1928, or 22 per cent of the total, were farm-owned. The estimates made annually since 1922 show a steady decline in the

percentage of farm ownership. If they may be assured to be approximately correct, then the contribution of farmers to current highway income through motor vehicle and gasoline taxes is at present not more than 22 per cent of the total of such revenues. As farm-owned vehicles are in general lighter than the average and generally use less gasoline per car than city-owned cars, it is probable that the actual contribution to motor vehicle revenues by farmers is actually less than the 22 per cent indicated by the registration figures.

With respect to the portion of current revenue derived from taxation of property, I have found no complete statistics. Real property is taxed by the State in 43 States. It is taxed by the counties in 46 States. It is from these taxes that the general-tax revenue for highways is derived.

In the State of Ohio, which may not be quite representative of the average, but which is the only source from which I have been able to obtain satisfactory data, I find that 26 per cent of the total valuation of real and personal property is classed as rural, the remaining 74 per cent as urban. The tax revenue is, of course, proportional to the valuation, and the indications are that, in Ohio at least, rural property pays approximately a quarter of the total general-tax revenue for highways.

Another indication of the possible extent of the respective contributions of rural and urban property is found in the census classification of population. The census of 1920 showed that 51.4 per cent of the total population at that time was urban. The urban percentage of total property value is doubtless higher; and it would probably not be far from correct to say that the average urban percentage is approximately 60 per cent.

If, then, we assume that 20 per cent of the motor vehicle revenues and 40 per cent of the property tax revenues are contributed by persons resident in the country, we find that of the total current highway revenue of States and counties, exclusive of Federal aid, approximately 30 per cent is paid by persons who live in the country and 70 per cent by persons who live in cities and towns. The corresponding percentages of current State highway revenue are:

Rural	-	22 per cent
Urban	-	78 per cent

For current local highway revenue they are:

Rural	-	37 per cent
Urban	-	63 per cent

From this review of the general status and character of highway finance in the United States, I think we may draw certain rather definite conclusions as to the policies most likely to yield success.

The first is that there is need for more scientific and businesslike financing and administration of highway improvement, which

should start with a selection of the roads to be improved according to their relative traffic importance, and an allocation of authority to State and county authorities on the same basis. It is apparent that there is still much to be desired in this respect. Differences between the percentage of total mileage included in the State systems of neighboring States of approximately the same general culture and development, as shown by the records, are too great to be accounted for upon any reasonable basis. So also are the differences too great between the annual expenditures per mile of State system in States that have systems of approximately the same extent and average traffic density approximately equal.

Highway building is a gigantic business. It should be conducted in a businesslike way. There is no excuse for inequitable allocation of funds or wasteful expenditure. The traffic survey furnishes a reliable means of determining such questions as the proper size of State systems, and necessary expenditures upon the several parts of the systems. It should be more generally employed as the basis of highway planning and budgeting.

We should put an end to this merry-go-round of income transfer between the States and the counties. As I have shown, the counties are rather generally the losers, and they can ill afford the loss.

We should face more frankly than we have, the question of indebtedness for highway purposes. The public loses, and loses

heavily when, to avoid a State debt, the counties are thrust into debts on which they must necessarily pay a high rate of interest.

In closing I should like to add that sound highway financing implies as essential adjuncts, so evidently as to need no elaboration:

First, reasonable security of tenure for competent executive officials; second, honest and businesslike administration; third, complete and accurate accounting; and fourth, adequate maintenance of the roads in which the public capital is invested.