

PLANNING OUR HIGHWAY SYSTEM

H. S. Fairbank.

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Last summer, when the Bureau of Public Roads started its 1936 fiscal year, it was clearly apparent that two major tasks confronted us. They were:

- (1) To concentrate on a program of highway construction which would reduce relief rolls by providing a maximum of employment.
- (2) To make a fundamental study of the highway problem as a whole, a study which would stress planning and financing of the entire system of highways, with special emphasis on secondary roads.

The reasons for, and the work done on the first task are no doubt well known to all of you. This discussion is concerned with the second.

Everyone knows we are having transportation troubles. Nearly everyone speaks of coordination of transportation as the solution. Some have reached the conclusion that we are overstocked with transportation facilities, but we might point out that we are overstocked with everything except unemployment. It is silly to make plans for the future based upon current transportation requirements or upon any assumption that existing facilities must be preserved. The growth of air and highway transport cannot be stopped, and the abandonment of unprofitable railway mileage will continue. The whole history of transportation in this country shows that it cannot be so controlled as to become static. Each type of transportation has its own field, in which it is supreme; each has its own handicaps. Our future planning must be based on a recognition of these facts. Knowing this, and moreover, knowing that three million miles of public roads in a country 3,000 miles long and a thousand miles wide offer a serious problem in basic highway planning, in which land use and all the social and economic factors common to our population must be considered, the Secretary of Agriculture has approved a comprehensive series

of highway planning surveys in cooperation with State highway departments. The surveys are already definitely programmed in States.

These surveys reflect an entirely new concept derived from our growth of understanding of the part highways play, not only in the national transportation system, but in the whole economic scheme of the country.

In the early days of the Bureau, when it was the Office of Roads, brought into existence by the demands of bicyclists for better roads, the work consisted mainly of propaganda. Sample sections of roads were built in different sections, and for a number of years road improvement throughout the country consisted of the construction of "pieces" of roads. They were purely local projects. Later, as the number of automobiles increased, there was a greater demand for roads, but there was still no idea of a road system as an economic necessity. The motorist, driving for pleasure, wanted to travel farther and more comfortably. The idea that the automobile was purely a pleasure car lasted for a long time, and still persists in the objection often made that roads were not built for trucks, and that trucks interfere with the enjoyment of and destroy the roads built for the motorist driving for pleasure.

The idea of a connected system of highway began to develop in some ^{of the States} in the teens. With the outbreak of the war, the tremendously increased movement of goods forced the use of highway truck transportation, and focussed attention to the need of a definite highway system.

In 1921, the Bureau began the development of a Federal Aid Highway System. Prior to that time, three quarters of the Federal Aid projects had been built without reference to their part in a national system. Since 1921, the Bureau has been aiding the development of a national system, but it has

been a limited system, confined to primary and trunk routes. That development of a main, though limited, system became our cardinal principle. Because of the adoption of that principle we have been able to complete, or nearly complete, the improvement of the main highways in a reasonably short time. Now we have reached the point where, having virtually completed the pioneer improvement of those main roads, we find it necessary to extend this improvement outward from the main roads into the next level, the secondary roads. This extension has two main objectives:

1. To maintain our present main road system and to develop it to a greater fitness for the traffic it must carry.
2. To develop our secondary roads rapidly and progressively to the point where they can function effectively as part of the highway system. To select properly the secondary roads to be improved is the main object of the State-Wide Highway Planning Surveys.

Scope of the State-Wide Highway Planning Surveys.

Each State survey will include the following studies:

1. Road Inventory.
2. Traffic Survey

- a. One-day blanket counts of traffic made at several thousand locations on secondary roads four times a year, once during each season.
- b. Density count of traffic, conducted at from 200 to 400 stations throughout the year, covering each day of the week.
- c. Operation of truck and bus loadometer weight stations, including acquisition of data on the origin and destination of the loads.
- d. Operation of pit-scale stations, including weighing of trucks

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and the measurement of height, length and width of vehicle and load as
udy of loading practices.

3. Financial and Road Use Study

- a. Financial study of sources and distribution of taxes and funds for roads and other public purposes
- b. Situs of motor vehicle ownership
- c. Road use study
- d. Pavement life

Secondary System a New Field.

In undertaking this work we are reaching out into a very large field. There are 2,700,000 miles of roads in this country which are not part of the main highway system, and out of these must be selected those which ought to be developed in a program extending through the next 15 or 20 years. It is not difficult to select, by ordinary observation, the primary routes or the most important secondary routes, but make a proper selection of the next most important secondary routes from such a large mileage requires a basis of facts. Such factual data can be obtained only by these surveys, hence their importance. This is one of the reasons for the surveys, but only the most obvious one.

Roads a Permanent Investment.
~~Development of the Federal Aid System.~~

Let us consider how we have handled road appropriations in the past. We have been raising money to build roads each year for the past 35 years, but we are still working on a basis of legislative programs drawn up biennially. It has been a hand-to-mouth process. The attitude has been that whenever we decide to stop spending money on roads, we can do so. The legislators as a rule tend to think of a constructed road as a completely finished project which has been paid for, and for which no further appropriation is necessary. We have brought them to recognize the necessity of maintenance, but we have not gone far enough

in making clear to those responsible for appropriations that every road is an investment which must be protected. Each year we have been adding to our highway plant, and we shall continue to add to it each year. Each mile of road constructed represents so much more capital invested, and carries with it the obligation to protect that investment. The highway system is a continuing responsibility which must be kept up perpetually, and for which taxes must be collected every year. We cannot stop paying for them at will.

Our task then is not only to build up the highway system, but to convince the legislatures not only that this is necessary, but that it is necessary to continue to pay for these roads after they are built. Every mile of new road adds to this continuing cost, and as the cost increases the greater becomes the necessity for the adoption of a definite policy governing appropriations for the highway system. Our surveys must set up a clear picture to convince legislatures, State and national, of the need for such a policy. We must show that appropriating a certain sum and then building a road does not complete the story. It is merely making the down payment, as in buying a car. Afterward we must meet the subsequent payments, and pay for the gas and oil and for the repairs, and we must plan how to raise the money for these subsequent expenses, to find perhaps that we cannot raise the money.

We must make these decisions about our road system. We now have a certain mileage. How much of it can we afford to keep? How much can we extend it, keeping in mind that every new road will be a permanent investment and a continuing obligation? The answer is in the return we get from ~~the roads~~ our investment in the roads. If the return is adequate we can afford to keep them.

But the cost of keeping, adding to, and maintaining our highway system must be met by taxation. The amount we can raise depends upon the ability and the willingness of the taxpayer to pay. We must show the taxpayer that he is getting a return, that the earning from his road investment may be a saving which he has not calculated, which perhaps he doesn't know he is making. Generally he does not realize how much he is saving in operating costs when he drives over an improved road, as compared to the cost of driving over that road before it was improved.

Planning Taxation.

We must plan out taxing. People are taxed for various public purposes, to build local roads, county roads, and State roads. Sometimes because of lack of planning these taxes reach back-breaking proportions. In recent years we have for the first time encountered resistance to the payment of taxes for roads, largely with regard to the payment of property taxes. When legislatures are confronted with such resistance, they take the easiest course: They lower property taxes and add a little here, a little there, to automobile taxes. But there is a point which cannot be passed without decreasing the number of vehicles in use. When automotive taxes reach too high a peak, the law of diminishing returns begins to function.

Future Limits to Automobile Taxes.

There are other factors affecting the automotive vehicle as a source of taxes. In the past we regarded the motor vehicle as the source of revenue for primary roads, and property taxes as the source for secondary roads. With property taxes reaching the point of diminishing returns, we must examine very carefully the potential ability of the automobile to pay for the secondary roads we plan to take into the highway system. In 1933, before the Government began pumping large amounts into emergency and relief construction, about 25 percent of the total expenditure on local roads came from motor vehicle tax-

ation (gasoline taxes and license fees), while about 90 percent of the expenditures on State Highways was from such motor vehicle taxes. Just what the situation is now, with sharp curtailments of local revenues and the pumping of much greater amounts of Federal funds, it would be hard to say. But the point is that we now have 25,000,000 motor vehicles, a figure which will increase, but not enormously nor indefinitely. The time of rapid increase in registrations has passed. There are several reasons for that: First, our population is approaching the stabilization point; if we reach 150,000,000 we shall hardly go beyond that; second, the automobile is now in the hands of as large a part of the population as ever can be economically capable of supporting a car. It is evident that we cannot greatly increase motor vehicle ownership. Some increase is possible still. The gasoline price level has been on a descending curve, ^{so that} although we have increased gasoline taxes from year to year, the gasoline cost to the consumer has gone down steadily. However, as we approach the time when gasoline production will be regulated to fit demand, or when the supply begins to fall off, we can expect an increase in fuel prices which will decrease the amount of motor vehicle travel, and reduce the owner's ability to pay taxes. We have been living in a fool's paradise. In the last 30 years we have been living as young men do, squandering our substance. Now we are getting older as a nation, and must live, as older nations do, a regulated life.

What Taxes are Needed For.

I have outline some of the reasons why we must plan our taxation, reasons which had to do with the difficulty of raising funds now and in the future, but obviously the main thing is to know first what taxes we need. We must know how much it is going to cost us each year to own the roads, as well as how much of that cost is to be borne by motor vehicles and how much by property.

We are not, in building up the secondary roads, building as we did on the first interstate roads. We knew we were making no mistake in building, say from New York to Philadelphia, but what guide have we for secondary road construction? We must know what we are doing and what it will cost. We must know where we should add more roads, and whether if we do so we can afford to keep them up, not for one year, but for years into the future.

To carry out our new concept of a national highway system we must lay our plans to fit situations caused by changes in economic trends and by mistakes that were made in our early transportation development. One of our mistakes was in railroad construction. In 1830, when the first one was built, it was considered merely another road. The Cumberland Pike had been graded across Indiana and into Illinois. Congress decided to abandon it and build a railroad, and we went on to build thousands of miles, many of which never should have been built. Now we have, especially in the East, thousands of miles that cannot continue to exist as railroads. We must know how many miles of road must be built to replace these unprofitable sections of railroad. Our studies in recent years have shown that in every case so far, a road facility is available to replace abandoned rail mileage, but undoubtedly there will in the future be cases where road facilities will have to be built. It should be done for the benefit of the public, and for the benefit of the railroads themselves, as they are coming to realize. Of course, this does not imply a loss to the railroads, but a gain. It relieves them of a burden of maintenance and operation which is hanging like a dead weight on the main lines. It permits them to operate a substantial system of highway transportation instead of a branch line railroad transportation.

There are other tendencies which we have to recognize and anticipate. Our whole economic trend is reversed. Where we had a concentrated movement into the cities we are now turning around to get out of them. That earlier concentration again was largely due to railroads. We had a large country, and the need to span it was great. That need was met by railroads. They offered opportunities for rapid communication as compared to the very slow communication possible over highways, so settlements clustered along the railroads. Where was the best place? At the intersection of railroads, and there the towns sprung up. Where the most railroads intersected grew the biggest town. Why? Because there industry could find its easiest outlet for its goods and could reach the widest territory. Why again? Because industry was largely powered by coal and coal was a fuel that had to be moved by the railroad and used by it. As long as we had steampower we had to have coal. Steam power is most efficient in large units, but not particularly so in small units. So we had a concentration of industry in relatively fewer large centers.

Contributing also we had the mechanization of farms, transplanting the men off farms where they were no longer needed to produce a given number of bushels of corn or wheat. They gravitated to the cities, still further concentrating population there. They went into manufacturing industries, not in making the shoes or the shirts or the broom handles, but in building the plants for the cities that accommodate them, by building the sewers, street car lines, apartments and houses.

The chambers of commerce prided themselves on the growth of their cities; the coal, steam, and rail communications tended to increase their size.

Now electricity has come, bringing ^{ing} light and power to small towns and rural areas. The highways permit travel by truck and automobile to towns far off the railroad. Electricity is going to lead inevitably to diffusion of industry: to build it up in small towns, to build up industry related to the soil so that there will be an agricultural-industrial merger close to the soil. There will be an increasing tendency to convert the product of agriculture into some refined form before it is shipped, thus avoiding the cost of moving useless bulk. Electricity will convert the product, trucks will move it over the highways.

Kansas City, Chicago and Indianapolis became great livestock centers because they were in that section of the country, the great open spaces, where nothing could be done but raise cattle. In the East there was only closed range, where crops were raised, and in time agricultural areas became manufacturing or industrial areas. Now a hundred years have passed, and these differences tend to level out. Live stock can be raised in the East and handled in local abattoirs. The differences in raising wheat and producing flour are no longer so great, although the flat areas are still the better adapted for machine cultivation. But it is essentially true that electricity and roads and the automobile are removing the differences between different sections of the country, and as this change goes on and the diffusion of industry continues the need for roads will increase.

Permanent Unemployment.

Another grave reason for better planning is the probability that we shall have to face a permanent condition of unemployment of a part of our population. After all, competitive private industry is concerned with profits. If investors cannot make a profit they do not invest their capital. There is an irresistible compulsion to cut costs and employ the most efficient production methods, which leads to mechanization and more and more of it. So as we

advance into more prosperous times and the demand for goods increases, that demand will be met only partly by the employment of men.

There will be need for projects not intended to produce cash profits, but for the social good, to build up the well-being of the people. There is any amount of that work waiting to be done. Our cities, with narrow streets built for horses and wagons, are completely antiquated in view of the present traffic situation. Old residence quarters, now deserted by people who because of the automobile are now able to live in the suburbs or country, present a problem of deteriorated property which will never again be used as it formerly was. In some places the problem has been met by tearing down old residences to make parking lots, but at best this is a haphazard process, used in place of a better and directed plan.

In the country, people in some sections have been living on a mere existence level, with farm homes having only the most primitive water supply; agriculture carried on in a primitive way; and the countryside unkept.

Here we have these things of public benefit to be done: The city waiting to be made over, the country lifted into something better. We are going to give men unemployment in this way, especially with highway construction and improvement. We shall plan a street system for the country, not merely a few main arteries, but a system of wide country streets.

Information to be Obtained by the Surveys.

All these things are tendencies that we must take into account in our future road work, and which all point to the probability of a very considerable increase in the size of our road-building operations. But what size? What road projects will be justified in undertaking? What will be the cost, and how shall we raise the money?

Every part of the State-Wide Highway Planning Surveys has some bear-

ing on the answers to those questions.

The Road Inventory.

First of all we are making the Road Inventory. The purpose of that is obvious. We do not know how many miles of roads we own, nor their condition, except for our intimate knowledge of the State highways. We shall not only get this information, but the location of houses served by these roads. That is important in view of the fact that, unlike the roads we have been building in the primary system, these roads are to ~~serve houses~~ give access to farms and houses. We need these facts for another reason. We must meet the political objections that are often raised to our concentration of effort on the most important mileage. When we talk about limiting expenditures to any given system of roads, farmers and their organizations come to us and say, "So many thousands of farm houses are not on improved roads". We have to put ourselves in a position to answer such claims, to know where the farm population lives, to know how many live on improved roads, to know how many will be served or will be directly on these roads. We shall know how many live within a mile, half a mile, ^{or} ~~and~~ two miles of a road.

The Traffic Survey.

The next phase is the Traffic Survey. This ~~records~~ includes the recording of the volume of traffic in the usual manner at key stations located on the primary road system, thus obtaining the volume of traffic at different hours of the day every day in the week. Even more important is the one-day blanket count of traffic on secondary roads four times a year, or once during each season. The blanket counts will give us the information we need in order to decide what secondary roads should be included in the system to be improved and which should be left to local authorities for maintenance, ~~this information is necessary to meet again a very definite lobbying and propaganda situation, a strong political pressure. We have been accustomed, as engineers, to base~~

and therefore what the cost will be.

The blanket-count figures will be adjusted, by use of the key-station density count, to a 24-hour basis. Then by plotting curves based on these figures we shall be able to establish a figure, taking into consideration the mileage, volume of traffic, and available funds, which will be used to determine the minimum volume of traffic which shall be the standard for acceptance of the secondary road into the system. Then, having ascertained, for example, that ~~funds are available for~~ improvement of 60 percent of the total road mileage would serve the needs of 90 percent of the traffic, we shall be prepared to meet the claim that "many thousands of farms are not served by the system" we intend to improve. We shall be able to show just how many farms are served, and how far they are from the nearest road, without any guesswork. ~~xxxxx xxxxxxxx~~

A Guide to Highway Transportation Legislation.

I have already discussed the need for solution of the vexing problem of legislative appropriations and tax legislation for road purposes. Another important objective of these surveys is to obtain information to serve as a basis for intelligent legislation on highway transportation.

Our highways are public property, and anyone may operate a transportation business on them. There are many laws regulating the use of highways, and some of them are very bad, but there is little enforcement. It must be recognized that such problems as wheel loads, length and width of trucks, et cetera, are finally solved by economic laws and not by arbitrary legislation. The truck operators are business men, and their decisions as to the size of vehicles and loads depend upon what is profitable.

The Pit-Scale operations will produce information as to just what loading practices, what sizes of vehicles and loads are considered by operators as economically correct, and this information can be used by legislators as the basis for intelligent restrictive legislation governing road use.

The Pit-Scale studies will also provide valuable information to be used in taxing vehicles. If, for instance, large numbers of 1 1/2 ton trucks are found carrying loads of 7 tons, it may suggest that taxes levied on larger trucks should be reduced, and those on overloaded light vehicles raised.

The Loadometer stations will help determine the range of operation of trucks, that is, whether they operate in a limited or a wide area. This information will help to determine whether we ~~should~~ build all or only a portion of our highways to accomodate heavy trucks.

Other general objectives of the surveys will be to answer, or at least provide information upon such questions as the following:

1. Should control of all highways be vested in the State Highway Department? Where control has been transferred from local authorities, to what extent has the Highway Department been committed by the change? So far, the motive for such changes has been to slough off local tax burdens without providing additional revenue to the State. To what extent should property taxes for highways be abandoned? Should or can motor vehicle taxation pay all road costs? Do trucks pay their full share of taxes? Should trucks be taxed for all roads or only for those they use?

At least partial answers will be found during the Traffic Survey in the studies of origin and destination, and type of origin and destination of traffic; and in the data obtained in the Financial and Road Use Surveys.

Financial and Road Use Survey.

Everything that has been said so far indicates the importance of the Financial and Road Use Studies. We must know what we are spending, and that nobody knows today. Nobody knows the total amount we are spending for roads.

We must know how that bears on the people, what burdens it imposes not only on the average citizen but on the various elements of the population. Are rural people taxed as they should be? Are they excessively taxed or not? Are city people adequately taxed? Are they excessively taxed? We must know these things, and know what these various elements of the population get for their money. How much service do rural people and city people get from the roads? How much do we now spend for roads? How is that expenditure made up? How much is for construction, maintenance, for the redemption or the purchase of bonds, for the interest on outstanding indebtedness? Until we know that we cannot even analyze what we are doing. When we have learned these things we can do what we wish to do. The financial and road use studies enable us to get at the facts and the benefits of taxation, and to determine how these benefits are flowing to the various elements of the population. We must know not only what we are spending but what we are going to spend in the future, and what the road we are now spending money on will cost us in the future. What we have been doing is more or less chancy. We have been doing things without knowing exactly whether they are right ~~are~~ or not. Perhaps we should spend more, or perhaps less than we are now spending, but before we can think about a future program, we must get what we propose to be reduced to annual cost.

Maintenance Costs; Road Life Studies.

We must know maintenance costs. We must know road life, the probable economic life of the road structure, the period of years over which to spread the capital investment. That is the purpose of the road life and maintenance cost studies. We hope to depend to some extent upon State records, but unfortunately in most States the records do not supply the information we must have. In order to offset that lack an effort will be made to go back through the whole construction history of every State Highway Department and to determine

the life of the roads in that system. Say the history starts in 1915, when we will say we built so many miles of concrete road. Now we follow the history of those concrete roads that were built in 1917, 1918, 1919, 1930, and 1934. We find a certain number of miles show no change, no reconstruction, no loss for a certain number of years. Then rebuilding is recorded, and the curve drops down from year to year. It is typical of many of the roads. Perhaps a road has been rebuilt or abandoned. All kinds of causes have contributed to the retirement of these investments.

~~These curves are very like the life insurance curves for a human being.~~

There may be a marked similarity in these curves to those of other and older States. If we can find a similar curve in another State, and overlay upon it the stub of a curve in the State we are working on, we can be sure that the subsequent history of our road will follow approximately along the curve representing the older road in the older State. So we can transfer information from one State to another in order to fill out the lack of positive or absolute information in the newer State.

We may find also certain roads built in 1910, 1911, et cetera, right up to the present time. Those built in 1910 are 25 years old. Among them are several concrete roads, some of which now carry traffic of considerable proportions, some of lesser proportions. We can pick representative samples of these roads or sections, and they will represent each a road of 25 years old, each with a certain traffic density at present. Thus we can build up curves representative of roads throughout their whole life, including roads carrying light and roads carrying heavy traffic.

It is like the course of a man's life. We can take a baby just born and record his progress throughout his life, and we will have charted a human life; or we can take, at one time, a baby in its first year, another in

its second year, another in its third, and so on until we reach 80 years. We note how many get small-pox, the measles, et cetera, and when; and we note when they die. Thus we can study the ^{probable} ~~whole~~ course of a human life, ~~from by using a number of different persons~~ by using data obtained on a number of persons for just one day or year. Since we have no record of maintenance costs, we can use the same method to build up the life of a road by using the record of many roads of various ages, and we can obtain good estimates of maintenance costs for that road.

Other Data to be Obtained.

We shall try, during the course of these surveys, to obtain data on a number of subjects that do not require quite so much man power as some of the studies. We shall make some studies related to traffic safety, such as the desirability of dividing four-lane highways. We shall try to determine proper sight distances for traffic moving at high speed, and we shall record all sight distances that are below a certain standard.

We shall make studies as to the requirements for superelevation of curves for speeds of 60 miles per hour and up, and studies of road surfaces and their relative safety, and we shall ask States to keep a record of accidents and their causes during the Surveys.