

# Facts Needed for Wise Planning

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There are two major objectives in highway planning. The first is that of providing the people who pay for highways and the legislative bodies who make the laws under which highway systems are built with all the essential facts relating to their highway transportation service so that they may determine what goal of achievement is most desirable and feasible for them. Second, provide the administrative agencies with a blueprint setting forth the program to be administered within the funds provided.

We are concerned with the development of plans which are practical, justifiable and feasible. We are not concerned with visionary, schematic approaches. Nor are we concerned with the development of plans which are dictated or controlled by inadequate fiscal support because that kind of planning would be penny wise but pound foolish. Certainly we can all agree that any plan to be most effective is one that we can all live with.

## *Evolutionary Needs*

Highway transportation needs are evolutionary. The evolution is influenced by many forces. The forces are those of our social and economic development which are translated into highway movement. Some of the forces that bring about change are negative; for instance, the great losses that are suffered through the highway accident toll and the even greater losses that are suffered in traffic operation through congestion.

As the forces bring about change, readjustments must be made in our highway goals—the highway plant must be changed to provide a relative balance with other forces which govern the amount and character of highway services. Failure to keep a proper balance only serves to stifle or retard other growth forces. Failure to adjust also wipes out many benefits and often brings great waste.

Every businessman recognizes the necessity for keeping production, distribution and sales in balance. Certainly the same principles apply in matters of public policy as much as they do in private industry. Also, I am sure every businessman recognizes that our present highway plant fails to produce maximum benefits in many areas; that highway capacity is far below what production, sales and usage demand.

Public interest in our highway problem in the last two years has been so great that we are now on the threshold of a program which will bring about a better balance in the forces of national growth. The national program as now visualized will provide the primary stimulus for this balancing process. But Federal aid alone as it now exists or as proposed will not solve the problem for most states. On the other hand, it provides such an important proportion of the needed support that it becomes most vital to you or any other state.

When the national plan is finally adopted, it would seem to me that every state must reappraise its own program to see just what is going to happen to it. The time would seem to be ripe for a completely evaluated and reoriented plan in every state and community. These plans must be founded in fact as established by engineering analysis. This would eliminate all uncertainty about the future of our highway transportation service.

In the ordinary concept, highway planning does these rather simple things:

1. Determines the amount of and importance of highway transportation to business and people over the main routes as they now exist and as they will be needed in the future.
2. Determines on the basis of their service, if not already done, how the roads and streets should be grouped for efficient management, development and operation.
3. Establishes highway standards adequate for present and future traffic, determines deficiencies now existing and accruing in the future, and estimates average annual expenditures required under alternative programs. Expenditures would include the cost of correcting existing and accruing deficiencies and the cost of annual maintenance.
4. Analyzes historical methods and effects of highway finance; analyzes and determines the adequacy and equity of various means of financing for the future to the end that legislative bodies are furnished a factual guide for determination of highway fiscal policy.

This latter element is of vital importance if we are to adopt a highway program that will produce a result matched with the needs of the highway plant.

### *How Far Ahead Can We Plan?*

The question is often raised—how far ahead can we plan? It is a good question. But no plan is of much value unless it fully recognizes the probabilities of the future. We cannot foresee the end of the necessity for improving, expanding and maintaining the systems. Therefore, planning must look as far ahead into the future as it is possible to do.

I would like to comment that today we are in a better position than ever to see into the future because the historical facts relating to our highway use have a longer undisturbed growth so we can forecast with much more accuracy. Second, our technical knowledge of the behavior of roadway facilities is sufficiently advanced so that reasonable forecasts can be made of future needs for replacement or retirement. In other words, our actuarial data are such that we can depend on them for more exact determinations.

Before going into the basic process of planning we might well consider for a moment what is necessary to make planning really effective; what is needed to take it out of the category of reports which land on the shelf and gather dust.

In the first place, experience shows that planning must be done by those who have an interest in the plans. In developing a program for a state, all the effort and time required to produce it likely will not result in action unless the people who have responsibility in determining highway policy—legislature and highway commission—are interested and wish to know the facts relating to the problem. The same principle would also apply in developing a highway plan in an individual county. Unless the commissioners are really interested in adopting a program supported by factual analysis of the needs, the effort may not prove fruitful. The same can be said of the development of plans for a municipality.

Secondly, the plans as they may be developed by any agency are not likely to be acceptable throughout the agency unless they carry the complete understanding and sympathy of the engineering personnel responsible for performance. In the several processes of development of plans or programs the talents and judgments of a composite group of qualified engineers are needed. When standards are set by the persons responsible for the everyday administration of such matters, they can translate the plans into actual production. If the criteria are not

uniformly accepted, actual carrying out of the plan will be distorted by the individual judgments of the men involved.

Third, to make the plan work there must be general public understanding of what the plan is. Too often there is an attitude of keeping plans more or less secret for fear of criticism. But in the type of work we are considering here it is important that as much of the public as possible be fully informed. If the plan is sound, experience has shown that public acceptance and support will be forthcoming. This makes the plan possible and goes a long way toward insuring its continuity of development. Legislative action is normally predicated upon public demand.

### *Steps In The Planning Process*

With that general background let us now turn to the several steps that normally constitute the highway planning process.

As mentioned earlier, a first requirement is that of an up-to-date inventory of our physical facilities. This inventory should provide a section-by-section listing of every basic element contained in the highway plant; what their structural elements are; what the geometric elements are; the age of the various elements; and the physical facilities that exist adjacent to the roadway. All data should be brought up to date and kept there.

A basic element of the inventory is the detailed analysis of the use being made of the facilities; how much and what kind of traffic is generated. Such determinations are important because in selecting standards of improvement required the basis function of the road has an important bearing.

The second major phase of the planning process is to establish a set of conditions or criteria which determine the adequacy of the present plant in all its gradations of traffic service requirements, which range from high-type, multi-lane, fully controlled access facilities down to the simple graded and drained access road. This is done by comparing what exists against a standard which, based upon engineering analysis, would be considered as appropriate to meet the traffic service requirements of a given type of facility.

In the planning process each highway and each section of a given highway must be compared against the basic standard appropriate for that particular class of highway and the amount of traffic serving it.

In the normal planning process there is developed what is called a set of tolerable standards which serve as a guide to show whether a given section is so seriously under-designed or in such bad condition that it can be rated as needing immediate improvement. Because of the

tremendous investment in the highway plant, professional engineers cannot recommend to the public that every mile of road not meeting modern standards must be scrapped or rebuilt. Sound engineering judgment must be used in determining the degree and importance of the inadequacy of a given section of highway.

Another important element of the facts needed is that of the age of the roadway structurally. We know enough about our roads to be able to forecast on an actuarial basis when roadway surfaces will have to be replaced or renewed. Road life tables have been developed for main highways which give the average life that may be anticipated from a roadway constructed with a given set of structural elements. In the planning process the anticipation of failure must be governed not only by the forecast of anticipated life but must be modified by an actual physical appraisal by competent engineers.

A second major element in the analysis of adequacy is that of evaluating the traffic capacity of our roadways. Under the conditions of greatly expanding numbers of vehicles and their usage, provision of adequate capacity becomes one of the most costly and important problems to be met in reconstruction. Only in the last decade have we developed accurate criteria for setting standards that will give us capacity for anticipated volumes and service characteristics of the highways.

Structural capacity must also be determined but that is more directly related to structural adequacy of pavement design.

In analyzing capacity requirements it is necessary to keep in mind future requirements. When we build a section of highway today, we expect it to serve adequately for many, many years, particularly when we relocate or rebuild with a changed basic geometric design. We then set a standard which will meet the anticipated growth and avoid the over-congestion that would develop otherwise as soon as the improvements were made.

### *Controlled Access*

In the evolution of the highway plan, the greatest deficiency to be overcome is that of capacity. Sheer numbers of vehicles on very important segments of our network greatly exceed the space now available. This is not only the case on many major intercity routes but it is particularly true in urban areas. It is in the provision of needed capacity that the modern engineering solution may seem to depart from past practice.

To provide the capacity for more movement and at the same time greatly improve the efficiency of movement, we must superimpose a

different class of highway over our existing routes. In the past we have in general created two classes of facilities: first, a vast mileage of roads and streets to serve property; second, a rather extensive mileage of so-called arterials. This second category has proved by and large to be neither fish nor fowl. Experience shows that the dual purpose arterial falls short of giving adequate service to movement and at the same time creates problems to business located on the arterial.

The controlled access facility is conceived for the purpose of movement of large numbers of vehicles. The volume of movement today, and that which will come, fully warrants the creation of a limited system of such facilities because the vehicle drivers have only one purpose in mind—that being to move from origin to destination as quickly and safely as possible. The express highway is the means we now have of maintaining the value of our present investment in properties and business and at the same time providing new capacity and a greatly improved transportation service to an important percentage of the movement of persons and goods.

The concept that should be kept in mind by creation of these facilities is protection for posterity of the investment designed solely for movement of persons and goods. What we must accept is that by subordinating the rights of a very few we are providing great benefits for a vast number.

*In urban areas, these facilities generally will cut driving time in half, cut vehicle operating costs in half and be twice as safe. In rural areas, they will be four times as safe, save some time and in many cases materially reduce operating costs.*

We look upon such investment as being permanent in character—at least as permanent as most things can be in this fast moving age of technological advances. One thing we must think seriously about is that space is becoming more and more valuable. We cannot think in terms of constantly moving our highway locations, so this time we should choose well and fix the lines for a long time to come.

In applying the criteria of adequacy we will, through the process, have determined which sections of highway are now deemed to be inadequate for present use, either structurally or in terms of capacity. We will have forecast the structural life to determine when structural replacement will be necessary, and we will have forecast our traffic requirements to determine the sections that will have to be modernized to meet the service requirements and when such modernization should take place. Following this, we come to the determination of the type and cost of the necessary facilities.

### *Cost Determination*

The method of arriving at the cost involved becomes one of utilizing costs as determined from actual work put in place. To determine future costs we arrive at the cost for a given type of improvement, based on a comparable cost experience determined by recent programs.

There was a time when we attempted to forecast for a considerable period in the future what might happen to the highway price index. I am sorry to say we have had to give up that practice. We have been unable to foresee with sufficient accuracy what might happen to our economic conditions for very many years ahead. Because of that, it is not current practice to try to forecast the price fluctuations of highway work for any period of years in advance. Therefore, the planning process produces costs based on current prices.

To offset our ability to forecast, we need to develop a process which will measure the effect of inflation, traffic growth and other forces on a year-to-year basis. This will prevent the shock that often occurs when these things are done once every decade or so.

Before going ahead to other parts of the process, I would like to call attention to one of the serious problems which must be dealt with in this type of work. We all realize that from a point of view of congestion, by and large, urban areas are most critical. In urban areas the greatest economic losses are occurring as a result of huge volumes of movement over antiquated street facilities. Generally speaking, we are using the same streets and street patterns that were developed before we were able to get rural travel out of the mud. It is in this area that we have perhaps the greatest need for factual information and sound processes of modernizing urban transportation. Unfortunately, it is here that there is the greatest lack of basic facts upon which we can develop sound programming. A real surge of enthusiasm for tackling the tremendous problem in urban areas on a comparable basis is just now getting under way.

Today, not only must a great deal of data be obtained, but many gaps must be bridged to evolve adequate plans for urban redevelopment of transportation facilities.

### *Translating Facts Into Programs*

With the basic analysis of need and of cost made, we come to the process of actually translating these facts into programs for development of adequate systems of highways and streets.

Inevitably it will be found that a large proportion of our existing systems are so critically inadequate that they constitute a large percentage

of the total needs over the next five or ten years. It would be a rather simple matter if a program could be adopted which would permit the construction or reconstruction of the systems in a year or two. As a practical matter we must look forward to a program which will bring us up to date on the most urgent needs in a reasonable period of time. We therefore must arrange a scheduling of needed improvements in some logical sequence over a period of time. This is normally done by setting up alternative programs of 10, 15 or even 20 years duration.

This gives the people and the legislative bodies latitude in selecting the program which they are willing to adopt, based upon their willingness and ability to provide the necessary financial support. Obviously, any responsible engineering administrator would like to see a program accepted giving him opportunity to provide a highway system which would meet traffic service needs in the shortest possible time. Often, however, needs are of such magnitude this desire cannot be met. Therefore, he must be content to proceed at a slower pace even though the economic benefits of short term programs would justify them.

The principles involved in developing a program are the same, whether it be for 10, 15 or 30 years. Basically, it consists of adding together the needs as they exist and the needs as they are forecast for each program period. If it is a 10-year program, the needs that exist now and the needs that will accrue in addition over a 10-year period are added together. If it is a 15-year program, the needs that exist now and the needs that will develop in 15 years are added together. The sum total of needs is divided into annual requirements. Generally they are expressed as average annual requirements. Say a 10-year program is adopted, the total needs of the 10-year period are simply divided by 10 and expressed as the average annual construction requirement for a 10-year program.

This provides a yardstick for fiscal analysis and enables the legislature to determine the level of financial support needed to accomplish a program in a given period of years. Without this yardstick no intelligent decision can be made by the legislature or administrative agency in setting up a goal to be achieved in highway improvement.

This process lends itself to one other important consideration in the matter of highway financing. That is whether or not credit financing is desirable and what might be accomplished by it. With highway need analyzed in relation to the time when they should be made, it is a simple matter to consider what portion of the highway program might be financed by bonds, if at all, and what portion should be on a pay-as-you-go basis.



The process also gives the administrator a sound basis for determining priority of highway improvement. In applying the principles of critical evaluation of adequacy of existing facilities a determination of the degree of deficiency that exists over the individual sections of the highway system is automatically provided. The highway administrator has immediately available a list of the sections which are most critical which he may use to develop short range plans in actual operation. It permits him to plan on a basis of three to five years in advance and to so schedule all operations of his organization. This short range programming, of course, must be controlled within the framework of the basic finance plan that has been adopted by the legislative body. We see many of our highway agencies who are using the highway needs study as the springboard for advance programming. They find that it has these advantages:

1. The entire organizational structure can be shaped to the program requirements.
2. Location and design can be scheduled most efficiently. Too many projects today are being designed under forced draft.
3. Because of the interlocking responsibilities of the several agencies, federal, state and local, much joint planning is required. It takes time to work out agreements on design, right of way acquisition and joint financing. Advance programming minimizes these factors.
4. Huge savings can be made by acquisition of right of way well in advance of construction, particularly in expanding metropolitan areas. This great opportunity is lost unless a firm advance plan is in effect and location lines fixed.
5. Construction schedules can be timed to achieve most favorable construction prices.
6. Maintenance can be scheduled to eliminate waste resulting from an undetermined construction schedule.
7. Stop-gap improvements can be held to a minimum and more properly evaluated as to type when a construction time table has been adopted.
8. Finally, public confidence and support is gained because of the knowledge that the administrative body is doing its job by means of constant study of the facts which guide the plan.

### *Summary*

To return to the whole process of planning, it is apparent that the engineering services which produce basic engineering facts as to need,

cost and alternative programs do not in themselves achieve the major objective. No program becomes a reality unless it is underwritten by a fiscal plan. Therefore, I would like to stress again the necessity for having a matching financial study made which will provide factual data for the guidance of the public and the legislative bodies in determining an adequate, feasible and equitable fiscal plan. Only when such a plan is adopted can we expect the highway engineer to satisfy the public. He cannot produce results which are satisfactory when he does not have the means for this accomplishment.

When the highway administrator does not have a fiscal plan which makes possible the complete achievement of a program, he must choose a course of action in keeping with the funds at his disposal. If funds are adequate to meet the needs, spread over a reasonable period of years, he has opportunity to utilize the findings of fact as a guide. If the financing plan is inadequate, the highway administrator must decide whether investments he can make will be to the standard that is warranted on a selective basis, letting the rest of the system serve as best it can with no improvement. Or, he may decide he must lower the standards for all improvements in order to spread available funds over the entire system. This latter choice, of course, fixes transportation services at an inadequate level, and for a long time.

Finally, it should be evident that the job of making this kind of analysis and producing an engineering plan wholly suited to the needs is one which requires top-side engineering talent. The technical knowledge required and the high degree of professional judgment that must be exercised make it mandatory that whether it be state, county or city, such professional service be utilized.

### *Conclusion*

In conclusion, the following facts seem to stand out as most significant in our future highway program:

1. That the national highway program, if enacted in the range that is now contemplated, will provide the largest single incentive we have had in the past three decades in accomplishing a desirable highway plan.
2. That every state and its local subdivisions will still have a responsibility of large proportions in providing an integrated highway system.
3. That it would seem to be most timely for each state, county and city to reappraise its own problem and legislatively adopt a plan of its own choosing that will insure adequacy and full integration of the systems of all agencies.