

What Should Highway Needs Study Reports Contain?

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Highway needs studies have been made for a wide variety of purposes: from a comprehensive study of all highway problems within a state, to one involving consideration of but one or two major problems. Report contents have varied widely because of this fact, and because of attempts by the states to tailor their studies to the particular audience at which the study is primarily aimed.

This paper presents the results of an analysis of all available highway needs study reports to determine what topics should be included in a comprehensive report, and the best method of presenting each topic.

The topics to be included in an over-all needs study report, as compiled from the analysis, are listed herein in a manner similar to a table of contents for a report. Facts and figures deemed essential to each phase were also developed from a review of the reports. They are discussed under pertinent headings.

This paper covers only report content. It does not deal with the factors of format and production which are also important for a complete report.

● **THE TITLE** of this paper has been phrased as a question because the review and analysis of all available highway needs study reports show that there seem to be as many answers to this question as there are reports. Part of the reason for the wide variance in content and scope undoubtedly can be attributed to attempts to tailor the studies to the individual needs of the states, and to particular audiences at which the studies were aimed.

Following analysis of the reports (bibliography included), the authors compiled a list of topics which seemed essential to a comprehensive study of highway problems in any state. The reasons for inclusion of each topic in the study are given in this paper, together with the data deemed necessary to presentation of a clear picture of the topic.

Briefly stated, each report should contain sufficient information on each topic to give the reader a complete understanding of the highway problem in the state under consideration and to support the recommendations made. The text must be clear and concise. Charts ought to be simple and should be used to cover every item requiring graphical explanation (see "Charts for Highway Needs Studies," Bulletin 158, p. 109). Photographic illustrations should be of high quality and chosen to depict clearly the points to be made. Visual aids will not be discussed further, as this paper will deal only with the topics to be considered for the text or body of the report.

The completed report will be directed mainly at two groups; the committee responsible for the highway needs study and the highway administrators and engineers of the state. It will also be reviewed by newspaper editors and interested citizens. Therefore, it should present the facts without bias.

Because the highway problems of most states include many items, the report can only cover the highlights of each topic. In this connection, it is suggested that separate detailed reports on each major subject could be developed for use of the highway department. Such reports will be useful as a "library of facts" for future reference, and for keeping up-to-date the needs studies. To be fully effective, these studies must be kept current long after the initial report has been made. To accomplish this, it is essential that good records be established and maintained.

The analysis of existing reports established that there were basically two types of

reports; one deals with both engineering and financial problems, the other type deals only with the engineering phase, but is supplemented by a report covering the financial study. Both types of presentation have merit. In any case, the engineering and financial studies must proceed together with the reports released at the same time.

Following the review of reports, a list of topics (Table 1) was compiled for a typical comprehensive highway needs study report. Each subject is treated as an individual topic in order to simplify presentation of this paper. The list of topics is not necessarily to be considered an example of table of contents to be followed closely in format of the actual report. Data to be included will be discussed under each topic appearing in Table 1.

Section	Topic
1.	Scope and Purpose of Report
2.	Economics of Highway Transportation
3.	Highway Use Existing and Future
4.	Classification of Highway Systems
5.	Standards of Design
6.	Interstate and Primary System Needs
7.	County and Local Road Needs
8.	Urban Street Needs
9.	Federal Aid
10.	Maintenance
11.	Administration
12.	Programing and Priorities
13.	Financial Needs and Highway Revenues
14.	Sources of Additional Revenue
15.	Recommendations

1. Scope and Purpose of Report

This topic will serve as the introduction and outline the scope and purpose of the report. It discusses the creation of the committee to make the study, or the decision by the department concerned to have the study made.

If the study was made as the result of legislative action, pertinent sections of the law can be cited to show the phases of the highway problem studied. Otherwise, the written departmental decision to make the study can be quoted to show the purposes and specific phases covered.

This section should include reference to the outside agencies making or assisting in the study.

2. Economics of Highway Transportation

Under various titles, most of the highway needs studies have included a section dealing with highways in the state's development. This has covered also the economic and social resources of the state. Such a discussion is important to the study as it develops the reasons for the present highway problem and outlines the future of highways in the state's economy.

Starting with a brief review of existing highway systems and the laws creating them, this topic will furnish economic background and related reasons for the highway problems under study. Present and future land use should be outlined, together with factors involved in the growth and distribution of the state's population.

This will involve discussion of agriculture, mining, manufacturing, business, commercial and residential land use and requirements. Each of these should be discussed only in sufficient detail to bring out their relationship to and effect on highways, particularly future highway use. It is important, for example, to depict the spread of residential areas around the larger cities of the state, and the need for transportation facilities in those areas.

The growth of the state can be developed in a brief history, which will include occupational and population changes. If there is any population trend toward urban areas, this can be discussed in some detail because it will have an appreciable effect on highway needs. Population trends and forecasts developed under this topic heading will be required in estimating highway revenues for the later discussion of future revenues.

3. Highway Use, Existing and Future

Some of the highway study reports have included this topic under the foregoing, and where discussed separately, there has been considerable variation in the extent of

material presented. However, knowledge of the use being made by vehicles of a state's highways is fundamental to the development of an adequate highway system and sufficient data should be given to allow the reader of the report to understand the subject.

The service highways have performed in the past and will perform in the future is one of the important bases of a needs study. The data are absolutely necessary for proper reclassification of highways, if needed.

Both the volume and the pattern of traffic should be established for the various classes of highways in the state. Trends in use can be developed from the growth and changing occupational character of the state as indicated under section 2.

Size and weight of commercial vehicles play an especially important part in structural design of roads and bridges. Full consideration must be given this subject in forecasting future highway use.

It is believed that this chapter is the logical place to develop registration data, persons per vehicle, vehicle miles by classes of vehicle, and motor fuel use. Trends in these factors over a period of years are essential for use in determining highway revenues of the future.

4. Classification of Highway Systems

Proper classification of highways into systems is one of the most important steps in highway planning. The need for such classification should be clearly set forth in this topic.

Criteria for classification must first be established. Definitions of the various highway classes and the bases and procedures used for classification should be outlined concisely, so that they will be apparent to those readers who are not highway engineers.

In order to explain the process of reclassification, each existing system of the state can be examined individually, and the service rendered by the various mileages appraised. By means of this appraisal, it may be determined that certain road mileage in each system should be changed to a higher or lower system. When these mileages have been determined for each system, the reclassification can be made and resulting benefits pointed out.

5. Standards of Design

This is treated as a separate topic in this paper in order to discuss it only once. Highway needs study reports logically deal with required standards of design in their discussions of each system.

The design standards set up for each system govern the adequacy and probable cost of future highways in a state. Structural and geometric standards should be selected that are fully adequate for the traffic the highways are expected to bear. They should yield the greatest safety and convenience to motorists possible, without being excessively costly in relation to their classification and the benefit to be obtained.

6. Interstate and Primary System Needs

This topic and the two following cover the physical needs of the highways and set the pattern for the long-range programs developed in the recommendations of the report. Because of the nature of the problems involved, both rural and urban sections of interstate and primary systems should be examined together.

Generally the interstate system comprises the highest traffic volume sections of the highway system. Therefore, their mileage has an overriding importance in the economy of the state and must be given first emphasis.

Interstate system projects represent a new concept in highways because of their high standards of design and rigid control of access. This latter feature has evoked some opposition from the public as well as a few local officials. The many advantages of interstate system design should be set forth in detail in this chapter—graphically and otherwise—to eliminate as much as possible adverse reaction to the system itself. Substantiating data can be used to show that this type of highway will save lives and injuries through fully adequate traffic service and that it will also result in direct mone-

tary saving to the autoist and trucker through reductions in vehicle operating costs.

The urban sections of the interstate system will have a direct bearing on the future growth of metropolitan areas, through both their design and location. The relationships of these sections to the urban development and mass transportation plans of cities of the state can be developed here.

With the material suggested in the preceding paragraphs serving as background, the specific state needs on the interstate system can be summarized. Needs for all systems should include rights-of-way and their costs. It is presumed in this statement that the needs study will be made in the state after the report requested by Congress in Section 108(d) of the Federal-Aid Highway Act of 1956 has been completed and the state's data brought up-to-date for this study.

Presentation of the needs on the primary system can follow along the same pattern as for the interstate system. It is believed that the procedures used in determining needs together with details of the resulting findings should be embodied in a separate report as part of the "library of facts" referred to earlier in this paper. General information on the deficiencies and inadequacies found can be discussed in summary form as was done in the 1955 report of the Michigan highway needs study.

In developing the needs it will be found that there are immediate pressing needs and future needs as volumes and weights of traffic increase. There will be a combination of both which will be economically feasible and that can be shown in tables listing costs by five-year periods. Rural and urban sections of the primary system should be tabulated separately.

Costs of modernizing the system can be estimated with the year of study serving as the base for cost data. This is not the place to introduce a discussion of the fluctuating value of the dollar.

It is recommended that the needs cost estimates be developed according to systems, as developed in the section on reclassification. Of course, the reclassification has been recommended but not adopted at this point; but it should be assumed that the recommendations of the report will be adopted. If desired, the estimates based on existing systems can be tabulated in a separate report, or as an appendix to the study report.

7. County and Local Road Needs

Establishing the needs of county and local road systems will be different, because of lack of complete information. The introduction to this topic can briefly outline the procedure used and stress the cooperative efforts of county engineers and township officials.

With the procedures outlined, deficiencies can be discussed and the means of correcting them described. The final step in this section will be summary tabulations of the costs of modernizing each system as reclassified. Estimates based on existing systems can be handled as those for the primary system.

8. Urban Street Needs

This topic will follow generally the methods employed for county and local roads. The procedures used, and the cooperative role of city engineers and officials will be explained. It is advisable to discuss arterial streets separately from local access streets.

In the discussion of arterial streets, it is well to explain their functions and to correlate them with the proposed freeways of the interstate system. These two highway systems, plus urban extensions of state primary routes, should form an integrated network of heavy traffic arteries for the collection and distribution of intercity and intra-city traffic. It may be found that the larger metropolitan areas need additional freeways to make a well rounded system. If so, their desirability can be stressed and their important place in the over-all metropolitan plan and transportation program emphasized.

Following this discussion, arterial deficiencies can be listed and modernization requirements developed. The cost estimates for meeting needs should be tabulated in a manner similar to that used for urban routes on the interstate and primary systems.

Deficiencies of local streets can then be listed and, from them, the needs established together with the cost of modernization. Needs for streets in suburban areas, found in most states around the larger cities, should be included. Generally speaking, these areas have developed in haphazard patterns in unincorporated portions of counties surrounding large cities. Provision must be made for them, and this part of the report could well devote some space to their future and how they can be handled. Their needs and costs of modernization should be kept completely separate from those of streets in incorporated places.

With development of needs of local streets, the needs of all systems and the monies required to make them adequate have been presented in tabular and other forms in sections 6, 7 and 8. These represent the major financial requirements; but there still remain other necessary expenditures and federal aid to be considered.

9. Federal Aid

Federal aid for highways represents an important part of construction expenditures. It is believed that this subject should be covered in one complete topic, although many needs study reports have considered it with each system. A logical place for this discussion is immediately after needs and costs have been well established, and before the costs are summarized.

A very brief history of federal aid for highways is suggested, with emphasis on the part it has played in development of the state primary system. This discussion can list some of the benefits derived from the cooperative effort of the states and the Bureau of Public Roads, together with the effective results of research.

The major concern of the needs study report, of course, is with future federal aid, particularly allocations for projects on the interstate system. The over-all effect of federal aid on state construction funds in the past should be explained. But the main emphasis in this section should be with estimates of future federal aid. This will be used in the section on financial needs of the highways.

10. Maintenance

Maintenance expenditures are increasing, generally, each year because of rising costs and higher standards of highways to be maintained. They involve large expenditures by the state, counties and cities and could well be handled as a separate topic to show the size and scope of maintenance activities. However, most of the highway needs study reports have included them in the discussion of the needs for each system, without emphasis.

To point up the large total of maintenance expenditures, they can be discussed by systems in one section. Because work by the state highway department will represent the greatest share of expenditures, and state data are more readily available, it can be discussed in some detail. Need for continuing maintenance, and the various types of operations required should be outlined.

The fact that the construction program involves reconstruction and modernization of many existing highways can be pointed out, and the resulting effect on maintenance costs discussed. Finally, future maintenance costs should be estimated annually, to be included in total highway costs for the duration of the programs suggested.

Maintenance costs for roads and streets of counties, townships and municipalities will not be available in as much detail as for state highways. Sufficient data should be available however, to develop fairly sound estimates of future maintenance costs so that total costs can be compiled for these systems.

11. Administration

Some of the highway needs study reports have devoted considerable space to administrative problems of the state highway departments and other units of state government having jurisdiction over highways. Recommendations were made concerning assignment of responsibilities, highway management, reorganization of highway departments and local units, and cooperation between units of government.

Because highway administration and management vary widely between states, it is not possible to suggest the exact extent of this topic in the report. It is recommended that the study include an analysis of the operations of the highway units in the state and that there be included in the report summary recommendations which will establish in the state efficient management structures and methods for the various highway agencies.

This section could also include discussion of highway operation and the needs for traffic servicing, including traffic movement, law enforcement and parking. Some of the study reports covered these topics while many did not.

Estimates should be made of annual administrative and operational costs on each system for the future, to be included in the financial needs of highways.

12. Programing and Priorities

This topic is essential to the study report for two reasons. First, the total needs established for each highway system of the state must be organized into financial programs. Secondly, the sections of inadequate highways must be grouped according to urgency so that a balanced program can be developed.

Many of the reports analyzed have suggested programs of varying length—10, 15 and 20 years, usually—together with the cost of "stop-gap" work and replacements necessary for each program. It is believed that such programs are a useful device as they permit comparison of various methods of financing. Programs should, of course, be prepared for each system.

One important administrative function is the programing of projects for construction. Advance planning is the only sure method by which the yearly operations of a highway department can be coordinated to develop an adequate highway system. This applies not only to the state highway department, but to all units of government having jurisdiction over roads and streets.

In developing advance construction programs, one of the necessary steps is to arrange the projects in order of inadequacy, to program first those requiring improvement the most. This requires establishment of a system of priorities—the subject has been covered fully in other Highway Research Board papers and will not be discussed further in this paper.

With the priority ratings serving as guides, programs for construction for each system can be compiled taking into account also other factors, peculiar to each state, to assure a balanced highway program in future years. It is suggested that the programs be established for five-year periods, subject to review during each period to make certain that the program is on schedule and kept abreast of current conditions.

13. Financial Needs and Highway Revenues

The prime purpose of this topic is to bring together all needs costs into one section, and to compare them with highway revenues under existing laws. This will show the financial size of the problems under any program suggested.

Up to this section, the report has been primarily an engineering treatise. From this point, the major emphasis will be on finance and the related problems of the state and its subdivisions. The method of financing highways will have to be considered separately for each system in the state.

First are the state taxes for highways, and other receipts accruing to the state highway department. Each tax levied by the state for highways should be discussed. Revenues from each tax should be estimated for each year of the proposed program as the revenues would develop under existing laws and under growth of motor vehicle use. These estimates can be based upon the material presented under topics 2 and 3. Growth of other receipts should also be determined and estimates made of income for future years.

However, revenues cannot all be used for state highways and highway construction. Costs of collection, refunds and other expenses must be deducted. Depending upon state laws and methods of operation, there may also be deductions for retirement of bond issues and, possibly, diversion to non-highway uses. In addition, there may be allocations to counties, townships and cities of state-collected taxes for highways.

It is difficult to suggest an exact method of handling these items, as they will vary greatly among states. However, the end result should be a tabulation listing revenues from each tax annually, or in 5-year periods, for the duration of the programs suggested, and allocations or deductions from the tax with the net available for use by the state highway department. This net can then be compared with total highway needs for each year or period. This will show clearly to the reader whether or not funds will be sufficient.

Similarly, county, township and municipal receipts for highway purposes can be developed for each system, and debt service and other fixed items deducted to show the net for highway purposes. The net can then be compared with the requirements of the proposed programs for the systems. While they have been discussed jointly in this section, they should be handled separately in the report.

Presumably deficits will be found for some, if not all, of the systems. In discussing these deficits it is suggested that the economic benefits of good highways be emphasized. This will help to offset a possible adverse reaction to the suggested increased taxes of the following section.

Savings to the motorist can be shown as resulting from changes in county roads as well as from the controlled access, heavy-duty interstate system. Benefits to industry and property owners can be cited to show the savings accruing to all citizens of the state from modern highways fully adequate for the traffic they will carry.

When this section has been concluded, the reader should have sufficient data to grasp the extent of the problem for each system within the state, and be prepared for the discussion on additional revenue requirements.

14. Sources of Additional Revenue

Development of sources of additional revenue for highways is most important in the report, as adequate financing is essential to any long-range highway plan. Although all states rely largely on motor vehicle taxes for highway support, assessment and allocation practices vary widely between states. This results in individual state problems and only general considerations are indicated in this paper.

Full thought should be given to bond issues for financing state highways. The added costs of bond issues can be offset by savings to the economy of the state through lowered costs of motor vehicle operation, relief of traffic congestion and other benefits.

Another consideration in use of bond issues is the fairly steady increase in construction and right-of-way costs. If these continue as they have in the past, highways built now will cost much less than they will several years in the future. Savings in such costs might well underwrite the additional cost of financing the bond issues.

Each of the taxes listed in the previous section can be examined briefly in the report, but only those with possibilities for increases should be considered in detail. This will include the gas tax, auto registration fees, truck licenses and miscellaneous fees. Re-allocation of motor vehicle tax allotments should be examined and, for other units of state government, increases in property taxes could well be considered.

In summary, all possible sources of additional highway funds should be taken into account in this section, and measured against the yardsticks of financial needs and possible increases in costs. If properly presented, the best sources of funds will automatically stand out and be readily apparent to the reader.

15. Recommendations

The recommendations contained in this section will be based on all previous sections. If the work has been well conceived and executed, the recommendations will be the logical conclusions to be drawn from the preceding discussions.

It is suggested that each of the recommendations be accompanied by two or three of the most cogent arguments for it, and the purposes it will accomplish. There are several reasons for this suggestion:

1. It will permit the "Recommendations" to be lifted bodily from the report and be understandable.

2. It will give those who read carefully only this section a sound outline of the study and its results.

3. It will form the basis of a summary report which, with photographs and other visual aids, can be published in quantity for the general public.

4. Because substantiation will be given for each recommendation, the study committee will be able to grasp the import of each, and deal with it, without reference to previous sections of the report.

This section is the most important in the report, because it "wraps up" under one topic all discussion that has preceded it. The program depends upon widespread acceptance of the recommendations. They must be authoritative and convincing.

CONCLUSION

The report as just outlined presupposes that all the data can be obtained in the state. This will not be true for all states at present, but the data should become available as states realize the value and importance of complete information to highway planning and in gaining public support.

In this paper, the ground to be covered and the most important items to be developed in the needs study of a state are shown. The steps recommended may not be applicable to all states, but are generally necessary for a thorough report.

This paper dealt only with content, and no discussion has been included of the format or production of the report. These items are most important, because a well-organized and attractively printed report is very helpful in obtaining acceptance of the report. An experienced layout and production authority should be engaged for this work.

Because the report must have broad scope—covering as it does the highway activity of an entire state, a multi-million dollars industry—it will necessarily be rather lengthy and some sections, by reason of the subject matter, may be far from popular magazine style. The report should not be aimed at engineers alone, but to legislators, state officials, editors and others with an active interest in highway progress.

For the general public, who should be convinced of the worth of a sound program because they have the final approval, a summary report is very helpful. The summary should of course, cover the highlights of the report, be written in non-technical language and simply presented.

The full report and its summary will present the facts on highways to the legislators and people of the state. Putting the recommendations into effect will be up to them, but the better the reports, the better are the possibilities of sound long-range highway plans.

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