AGENCY FOR INTERNATIONAL DEVELOPMENT
WASHINGTON, D. C. 20523
BIBLIOGRAPHIC INPUT SHEET

FOR AID USE ONLY
Batch 72

1. SUBJECT CLASSIFICATION	A. PRIMARY: Development and economics	DC00-0000-0000
	B. SECONDARY: Development assistance	

2. TITLE AND SUBTITLE
Pre-investment surveys,a critique of 81 cases

3. AUTHOR(S)
(101) Brookings Institution,Washington,D.C.

4. DOCUMENT DATE	5. NUMBER OF PAGES	6. ARC NUMBER
1965	53p.	ARC

7. REFERENCE ORGANIZATION NAME AND ADDRESS
Brookings

8. SUPPLEMENTARY NOTES *(Sponsoring Organization, Publishers, Availability)*

9. ABSTRACT

10. CONTROL NUMBER PN-AAB-998	11. PRICE OF DOCUMENT
12. DESCRIPTORS Investments Project evaluation Cost engineering Technical assistance	13. PROJECT NUMBER
	14. CONTRACT NUMBER Repas-5 Res.
	15. TYPE OF DOCUMENT

AID 590-1 (4-74)

PRE-INVESTMENT SURVEYS: A CRITIQUE OF 81 CASES

Transport Research Program
The Brookings Institution
Washington, D. C.
June 1965

CONTENTS

	Page
The Role of Pre-Investment Studies in Project Appraisal . . .	4
Terms of Reference for Pre-Investment Studies	10
The Project in Relation to the Economy	13
The Project in Relation to Other Transport Facilities	15
Investment Analysis: Costs and Benefits	17
Conclusions	38
Exhibit I - Survey Format	42
Exhibit II - Terms of Reference for East African Road Project	48

Pre-Investment Surveys: A Critique of 81 Cases*

This analysis of pre-investment studies completed in recent years under the sponsorship of the major aid-giving agencies is concerned chiefly with weaknesses in previous studies. No attempt is made to "second guess" the recommendation of any study; instead the focus is on techniques of analysis and their inadequacies.

The authors of many of the studies analyzed are fully aware of the weaknesses of presently accepted techniques; indeed in some cases the suggestion to use the study came from them. Because examples do not fairly represent the studies in their entirety, most references have been deliberately obscured to avoid their identification.

Eighty-one reports concerned with economic development problems of nearly forty countries were reviewed. Most of the studies were made by private economic or engineering consulting firms under contract with the various aid agencies, although some of the reports were written by

---

*This analysis is based on work done by Tillo E. Kuhn, Clell G. Harral, Grace W. Finne, and Eleanor B. Steinberg. Mrs. Steinberg's draft is here used *in extenso*.

agency officials. Approximately half (forty-two) of the studies dealt with individual prospective transport projects, such as the construction of a specific port or the improvement of a certain road.

Thirty-three of the studies consisted of general economic development planning surveys and general transport planning surveys. Some of the latter covered the overall transport system of a country or region, while others involved more than one transport mode (but not all modes), or all of one mode (such as a survey of a national highway system). The remaining six studies dealt with surveys and project proposals in power and telecommunications--fields similar to transport in that they are often classified as "infrastructure" and usually lend themselves to comparable evaluation techniques.

The studies were selected to cover a wide range of projects, as follows:

Type of Study	Number
I. Feasibility Studies	42
a. Highway	30
b. Railway	4
c. Port	7
d. Airport	1
II. General Planning Studies	33
a. Economic Development	12
b. Transport	21
III. Power and Telecommunications	6

Of the eighty-one studies, twenty-seven were sponsored by the Agency for International Development (AID), or its predecessor agencies, and thirty-one by the International Bank for Reconstruction and Development (IBRD or World Bank). The remaining twenty-three reports had various sponsorships, including some governments of developing countries. Only one of the twenty-three was privately sponsored.

The research team reviewed twenty of the eighty-one studies in great detail, in accordance with an established survey format. (See Exhibit I at the end of this study.) The survey format is essentially a list of key questions which an official of an aid-giving agency would want answered by a pre-investment study. If all of the questions were answered fully, a study would then be regarded as highly satisfactory. Since highway development projects were more numerous than other types of transport projects, the format was drawn up with particular regard to the problems of highways, but, in general, it is applicable to all transport and other infrastructure projects.

These twenty studies constituted the primary basis for this study, and nearly all of the examples cited are drawn from them. The remaining sixty-one studies, although read in entirety, were reviewed only in terms of Part I of the format. Although these studies were analyzed in less detail than the others, the research team felt that their

conclusions concerning the twenty were definitely corroborated by their review of the other sixty-one.

THE ROLE OF PRE-INVESTMENT STUDIES IN PROJECT APPRAISAL

A potential transport investment goes through many stages of project preparation and evaluation before a decision is reached as to possible financing and execution. These steps are not always the same for all projects and vary greatly among the various aid agencies.

Project Preparation and Evaluation in IBRD

Any classification of the steps involved in project preparation and evaluation at the World Bank must be somewhat arbitrary because no two loans are handled in precisely the same way. However, the basic phases can be outlined roughly as follows: (1) loan application or request; (2) preliminary or reconnaissance report; (3) detailed consultant report; (4) final appraisal report.

Reconnaissance Report. A reconnaissance study is frequently a brief and usually a low-cost report, the product of a short field trip by outside consultants or agency officials to assess a project on a preliminary basis. After receiving a request from a member country to consider a loan for a given project, the IBRD generally sends a reconnaissance mission to the field to prepare a report for internal use. This reconnaissance report, which typically focuses almost entirely on the economic aspects

of a proposed project, is often the basis for a decision by IBRD to "go ahead" with a project in existing form, to recommend changes in the project, or to shelve a project temporarily or indefinitely.

Consultant Report. The World Bank sometimes, but not always, engages private consulting firms to undertake economic and engineering studies for prospective loan projects. Broadly speaking, those consultant reports focusing on the economic aspects of a project deal with the anticipated effects of the project on the economy of the country in question. Engineering studies are concerned primarily with engineering specifications and costs of the projects. (These studies are counterparts of the "feasibility study" in AID project preparation procedures.) The main points and principal findings of the consultant reports are generally included in the IBRD "appraisal reports." However, if a private consulting firm is not hired and the work is undertaken principally by IBRD officials, this entire phase is merged into the appraisal report stage.

Appraisal Report. The appraisal report, the final report in the World Bank project preparation process, includes the principal findings of the economic, financial, and engineering studies of a specific project. Frequently a very detailed report, it is prepared by the staff of the Technical Operations Department. Each division of the department is responsible for the preparation of reports in a specific field. The transport division

prepares reports on roads, railroads, ports and waterways with the help of engineers, economists, financial specialists and other technicians who specialize in a certain mode of transportation. The appraisal report is addressed to the President of the World Bank, who presents it, together with his own comments and recommendations, to the Board of Directors. The recommendations are nearly always positive and usually result in the granting of a project loan. The reconnaissance stage is normally the point at which a project is rejected if it is going to be.

Project Preparation and Evaluation in AID

The basic steps in the project preparation and evaluation process in AID are: (1) "field generation;" (2) detailed feasibility study; (3) loan approval.

The idea for a project is typically generated in the field by AID officials stationed in a particular country, or, in some cases, by the host government. If the idea for the proposed project is favorably received in Washington, the next step usually has been a feasibility study. In the past, a preliminary or reconnaissance type of report was not made by AID prior to the feasibility study. Recently, however, the reconnaissance report has begun to be incorporated into the agency's process for project analysis.

The lack of reconnaissance studies has been a weakness in AID procedures in the past, and this in turn has often contributed to the weakness

of many feasibility studies. Because of the preliminary character of these studies they have a certain neutral 'no obligation'' tone, and thereby offer an opportunity for rejecting or postponing a potential project before the hopes of the host country are raised too high and before the agency has become so involved that it feels committed.

Feasibility Study. The feasibility study is the basic source of information in AID pre-investment project analysis. The Foreign Assistance Act of 1961, Section 611, requires a technical and economic feasibility study for all capital projects in excess of $100,000 to receive U.S. financing under the provisions of the Act.[1/] To implement this provision, consulting firms under contract with AID have been advised to prepare their reports along the guidelines set forth in the AID manual entitled, Feasibility Studies, Economic and Technical Soundness Analysis, Capital Projects.[2/]

The feasibility study is similar to the consultant reports described earlier under IBRD procedures. The end result is intended to be a determination of the economic and technical "feasibility" or "desirability" of the proposed project. Frequently, the feasibility study is the first formalized report in the preparation of a project. For example, an AID loan of over

---

1/ Legislation on Foreign Relations with Explanatory Notes, Joint Committee Print, Publication No. 93389, 88 Cong. 1 sess. (March 1963), pp. 30-31.

2/ Issued June 1, 1962, and revised September 1, 1963.

$7 million to a South American country for the improvement of three roads and a bridge was based on feasibility studies without any prior reports.

Loan Approval. The final stage in AID procedures is that of loan approval. This is an administrative procedure in which the loan is either disapproved or approved, theoretically on the basis of the feasibility study. Although the recommendations of virtually every feasibility study are positive, the loan is not approved in every case.

Cost of Pre-Investment Studies

The most important factor determining the cost of a pre-investment study is the amount of engineering involved. As a result, there is a wide variation in the outlays for different types of studies.

A recent reconnaissance study sponsored by AID that involved no engineering cost only $31,000. The contract paid for two economists each working two man-months in the field, local technicians and secretarial help, and one man-month for each of the two economists to complete the report in the home office. The $31,000 also covered the cost of reproducing fifty copies of the report and a fixed fee for the contractor.

By contrast, an economic and technical feasibility study which included preliminary engineering for the improvement of an 85-mile highway

was estimated to cost $150,000 and required about six months to complete.[3/]

AID funds obligated for a feasibility study of a bridge, including studies and cost estimates of connecting roads, amounted to $250,000 for a six-month study,[4/] while an economic and engineering feasibility study for a proposed 957-kilometer road, including preliminary engineering and with a four-months' time constraint, cost $900,000.

A complex economic and technical feasibility report dealing with the siltation problem of a port and the feasibility of locating an alternate port in another city was sponsored by the United Nations Special Fund, with IBRD as executive agent. The study was completed in one year at a total cost of $1,365,000, of which the Special Fund paid $1,015,000 and the host government the equivalent of $350,000.[5/]

3/ Foreign Assistance Act of 1963, Hearings before the Committee on Foreign Affairs, House of Representatives, on H.R. 5490, 88 Cong. 1 sess. (1963), p. 264.

4/ Ibid., p. 258.

5/ United Nations Special Fund, Report 1963: Target: An Expanding World Economy, p. 44.

TERMS OF REFERENCE FOR PRE-INVESTMENT STUDIES

The terms of reference for pre-investment studies are essentially instructions to consultants with regard to data which should be obtained through field investigations and the desired analysis of the data. The terms of reference are normally included in the contract between the aid institution and the consultants and are frequently included, in full or in summary, in the final report.

The terms of reference are very important because they affect the orientation of the consultants and determine the framework of the report. In some cases, the terms of reference are extremely detailed; in others, they are short and not very specific. However, the terms of reference for AID surveys are often written in such a manner as to influence the conclusions of the final report. In numerous reports, it appeared that the aid institution had already determined to build a certain road or rehabilitate a railroad (perhaps for political reasons) and regarded the consultants' report as merely a means of justifying the project in question.

It should be noted that there is a difference between project justification and project appraisal. When an aid agency has already, in fact, committed itself to a project before the investment analyses are made, it

is generally felt by agency officials that the conclusions of the studies are not supposed to be negative with regard to the project loan, and the task of consultants becomes that of presenting a rationale for the project.

Project appraisal, on the other hand, implies a genuine economic analysis of the project. Its conclusions about the economic desirability of implementing a proposed project may be either favorable or unfavorable. There is always good reason for honest appraisal even in situations where the final result is predetermined because only the appraisal can reveal the economic costs of pre-determined objectives. Unfortunately, project justification and project appraisal in practice are often intertwined, and a positive bias in the terms of reference is frequently found in AID-sponsored studies. An illustration of terms of reference with an inherent but perhaps unintended positive bias may be found in those drawn up for a port feasibility study:

> "Conduct such studies, investigations and surveys as may be necessary to determine and recommend a technically sound and economically feasible long-range general plan for the development of the port area.
>
> "The construction increment which is recommended for initial implementation shall be so planned so as to afford a port facility which will most efficiently and economically serve present and reasonably projected traffic," [Italics ours.]

To render a more objective flavor, these terms of reference might have been written as follows:

> "Conduct such studies, investigations and surveys as may be necessary to determine whether or not it may be

> technically or economically sound" etc. and to conclude "if construction is not deemed advisable at the present time, state what other measures may be initiated so as to afford an operable port facility which will most efficiently and economically serve present and reasonably projected traffic."

In the past two or three years, AID has initiated a limited number of reconnaissance studies. In some cases, the terms of reference for the consultants undertaking these missions have been less biased in tone and far more complete than those for most feasibility studies. In 1963, AID contracted for a reconnaissance study of a proposed road project in Africa. The consultants were requested to investigate the economic benefits of the road, which was to constitute "Phase I" of the reconnaissance. If the economic report proved favorable, "Phase II," or the engineering side of the project, was to be covered by a subsequent mission. The text of the terms of reference for the "Phase I" consultants are shown in Exhibit II at the end of this study. Briefly, the terms of reference for this project covered the following major topics: (1) effect on development in project area; (2) position of project in overall program; (3) relation to other transport systems; (4) anticipated economic benefits; (5) present and future traffic generating activities; (6) traffic capacities; (7) justification of the scope of improvement; (8) indigenous capabilities.

The very comprehensive terms of reference resulted in an equally comprehensive report in which the consultants took the initiative

to go beyond the actual wording of the terms of reference and suggest an alternate route for part of the project. Such an alternate solution might have been incorporated in the original terms of reference under Section I, "Effect on Development in Project Area," by inserting "(d) if an alternate route for the road or part thereof seems more beneficial to the development of the area, include the alternative solution and state reasons why preferable."

It may be questioned, however, whether a project can be evaluated without taking the estimated investment into account. Benefits must be considered in relation to costs, and even with preliminary cost figures, the conclusions of a study may require further engineering findings. Local construction costs per mile in similar terrain and bridge construction costs per foot of bridges with similar spans may be used as rough estimates, and the terms of reference should have required such preliminary cost estimates, with an estimate as to the probable range of error.

THE PROJECT IN RELATION TO THE ECONOMY

After the terms of reference, or purposes, are set forth, the next section of a pre-investment study is usually a description of the economy of the country. The major weakness of this phase of pre-investment studies tends to be a failure to relate the general economic information to the proposed project.

One highway feasibility report from a developing country included fifty-two pages of general economic and geographic data covering location and external connections, terrain and soils, geology, climate, water supply, natural vegetation, population, education, labor force, agriculture and forestry, mineral resources, energy resources, industry, foreign trade, and national financial position. This extensive coverage, however, was poorly integrated with the analysis of the road project. While the economic analysis pointed out the importance of a major crop to the economy, there was no discussion of the current marketing practices of this main crop and how the road project might affect them.

In another feasibility study of a road project, twenty-three pages were devoted to general economic analysis and to the importance of highway transport in the economy. Included were such subjects as location, physical features, economic features, geology, meteorology and hydrology, temperature and wind, gross national product, principal commodities, technical skills, land values, truck transport profits and road accidents. Additional economic information was brought into the report in the form of interviews with government officials, None of this information was specifically related to the proposed project. In addition, the amount and nature of other investments contemplated for the area affected by the road project were not covered.

In contrast to the extensive coverage in the reports cited, another feasibility report on a highway project stated that the economic

information for the area covered was too voluminous to be included in detail in the report; consequently, the general economic coverage was confined to one paragraph.

In sharp contrast to these typical examples is a study for a comprehensive highway program for a country in Central America, where a comparatively successful effort was made to relate the proposed highway system to the national economy. The entire study and its recommendations were derived from the development potential of the country and the policy goals of the government. Not only were detailed population and other data included by region and by type of economic activity, but the information was made the basis for transport planning and traffic forecasts. Other studies also presented demographic information (although rarely in such detail), but the difference between these studies and the Central American study was that the latter actually used the population projections in order to project domestic food requirements. The remainder was assumed to be available for export, and this information was in turn used in determining transport requirements.

THE PROJECT IN RELATION TO OTHER TRANSPORT FACILITIES

The major reason for relating a proposed project to existing regional transport facilities is the possibility that what appears to be

optimal from a project standpoint may be less than optimal from a regional standpoint. For example, one feasibility study for a road project dealt exclusively with the proposed highway, and almost completely ignored the effect of the new road on existing water, rail and air connections for the same route. In a study for a highway project which involved an international connection no discussion was included of other components of the international connection and their implications. In contrast, another railway study devoted an entire chapter to related problems of road transport.

Relating the proposed project to transport facilities outside the region immediately affected by the new or improved facility is important for two main reasons. First, there is the question of technical compatibility of the new facility with connecting transport media. For example, if a study concluded that a transport facility was required in province X and that the most economical facility would be a road, consideration should be given as to whether goods moving over the new road would, in order to reach their final destination, have to be transshipped to an inland water facility or to a railroad, thus involving costs not included in the initial calculations.

Second, there is the problem of economic compatibility of the proposed facility with other transport facilities outside the immediate area of influence. In one overall transport study it was discovered that

a local marketing board had authorized a certain amount of the major crop of the northern section of the country to be hauled to a southern port by road. This traffic had previously been hauled by the national railway system (which the report considered to be the low-cost carrier). The diversion of export-traffic from rail to road resulted in the loss of a considerable amount of the higher rated import traffic. Traffic diversion resulting from a new facility in one region of a country can have consequences for the entire transport system.

INVESTMENT ANALYSIS: COSTS AND BENEFITS

Benefit-cost analysis was the principal technique for investment analysis in the majority of the project-oriented studies. This technique generally consists of adding up the estimated benefits and costs expected to accrue from a proposed project. Only one of the studies made any attempt to discount benefits or costs. (See the later section, "Other Problems of Benefit-Cost Analysis.") A ratio of benefits over costs was then computed. If the ratio was 1 or greater than 1, the results of the investment analysis were considered positive; the project was considered worthwhile and in many cases was undertaken by the aid agency which financed the feasibility study.

The conceptual difficulties inherent in the benefit-cost technique are dealt with in "Preparation and Appraisal of Transport Projects"

by Clell Harral.[6/] Since this technique was in fact used in most of the pre-investment studies, attention in this paper is focused on chronic errors in benefit-cost calculations rather than on the method itself. The line between theoretical and practical difficulties is not sharp, however. Some of the errors of the benefit-cost calculations included in the feasibility studies stemmed directly from conceptual difficulties.

In general, the outstanding weaknesses of the benefit-cost analysis in the project studies were the overestimation of benefits and the equally serious underestimation of costs. This meant that the benefit-cost ratio in virtually every study turned out to be 1 or greater than 1. The consistently positive results of the investment analyses fit in very well with the frequently positive bias of the terms of reference which was discussed earlier.

Problems in Measuring Benefits

Broadly speaking, all benefits which derive from transport projects are in fact net increases in production of final goods and services. These net increases in production come about in one or two of the following three ways: (1) where there was no transport facility at all prior to the investment in question, agricultural industrial or other types of production may be stimulated by the new facility; (2) where there is an improvement of an existing facility, new production may be stimulated by reduced costs or

---

6/ Available from the Transport Research Program of the Brookings Institution.

increased capacity; (3) when an old facility is improved, there is also a release of resources due to reduced costs which may be transferred to other uses.

Defining Benefits. Although there are a number of conceptual difficulties, the practical implications of which led to gross errors in estimating benefits, special mention must be made of two frequently recurring problems. Both of these problems derive from a failure to define precisely the term "benefits"--to determine what should legitimately be counted in a benefit-cost analysis and what should not.

The first problem was failure to distinguish between financial benefits and economic benefits. Briefly, financial benefits are those which have a monetary value and which a banker or accountant would consider when investigating a loan. These include, for example, revenues which would accrue to a government from gasoline taxes generated by new or improved road, or from port dues levied on users of a new port. It is necessary for an aid agency to undertake a financial analysis of a specific project (or of the national budget, if the project is not expected to be self-liquidating) in order to determine whether or not a loan can be repaid. But this type of analysis should be kept entirely separate from the economic feasibility study of a transport project, or any other developmental project. The purpose of the economic as distinct from financial appraisal

is to allocate resources efficiently--to choose the right investments. The primary concern should be the developmental impact of the investment. The criterion to use in determining whether or not a particular item should be counted as a benefit is whether it contributes to raising the output of the economy.

One study of a road project provides an example of confusing the economic with financial benefits. In this case, the only benefits which the consultants used in the benefit-cost ratio were government revenues. These included direct revenues generated from user taxes on vehicles, tires, fuel, etc., plus indirect revenues computed as the percentage of Gross National Product represented by highway transport multiplied by total government revenues minus the direct transport taxes on vehicles, fuel, tires, etc., mentioned above. A total annual anticipated tax receipt per vehicle-mile was then multiplied by annual projected traffic estimates in order to arrive at total tax revenues, or total benefits. A number of traffic projections were made. One method involved estimating population and GNP and correlating traffic growth with that of GNP. Another estimate was based on the assumption that the traffic growth on this particular road would approximate the average traffic per square mile in the broad geographical region within which the road would be located.

In this example, the estimation of benefits suffered from at least three shortcomings: (1) The method of estimating the indirect tax

revenues was highly questionable. The existence of indirect tax revenues was simply assumed. No specific levies of this type were mentioned, and it is conceivable that there were no sources in indirect revenues. Furthermore, there was no valid reason to assume that whatever indirect tax receipts might have existed were equivalent to the proportion of GNP comprised by highway transport. (2) Future traffic was not estimated on the basis of projected increases in real output or on population shifts which would result in part from the new transport facility. Instead traffic estimates (like indirect tax receipts) were made on the basis of aggregate projections, such as GNP and population. The correlation of future traffic, future vehicle registrations, and other transport data with projections for GNP or other national aggregate figures was a common error found in pre-investment studies. This type of correlation is valid only for aggregate traffic projections and even then the relationship cannot be assumed to be stable. (3) By taking government revenues as the sole measure of benefits, emphasis was placed on the financial merits of the project and no way was provided for integrating the economic benefits into the benefit-cost analysis.

The second problem resulting from failure to define benefits precisely concerns "indirect" benefits. In some studies, an attempt was made to distinguish between direct and indirect benefits and to include both

categories in the benefit-cost calculations. Although there was no consensus as to what indirect benefits actually were, most of the studies treated them according to one of two definitions: (1) Indirect benefits are those "intangible" nonmarketed, and nonquantifiable benefits of a social, political, or military character. (2) Indirect benefits are those which accrue to others than users of the project.

Often, the intangible, nonquantified benefits were introduced to increase the benefit side of the benefit-cost ratio and to insure a ratio greater than unity. Sometimes these benefits were simply alluded to as an additional argument on behalf of the proposed project. For example, one study of a proposed road project included such questionable benefits as general enhancement of road transport (this "benefit" could be obtained from any project) and stimulation of tourism (although the resort area in question was already connected with the national railroad system by a hard-surfaced road). These alleged "benefits," although not quantified, were regarded as sufficient to offset a higher cost of moving the potential freight by the proposed road rather than by the existing railway.

The indirect benefits implied by the second definition--benefits to nonusers--are usually not legitimate benefits in that they almost invariably involve double-counting. These benefits are typically the same ones passed along from one person to another. In the same study of a road project, the reductions in total operating costs were counted as a direct

benefit and increases in land value as an indirect benefit. This is, however, the same benefit since savings in transport costs increase net profits in agriculture which in turn raise land values; the transport operator's benefit is being passed along to the farmer or land owner.

It is possible that an investment will result in external economies or diseconomies accruing to other sectors which should be added to or subtracted from the other measured benefits. Whether or not there can be such externalities depends upon whether the project is being analyzed from a national, regional, or strictly project point of view.

Estimating Legitimate Benefits. The broad categories of benefits which should be included in a benefit-cost calculation are: expected new production, stimulated partly or entirely by a new or improved transport facility, and resources released by reductions in costs of handling existing traffic.

A major criticism of the pre-investment studies was that very few of them attempted to estimate anticipated increases in real output. Some studies undertaken for "penetration," "developmental" or feeder roads failed to project estimates of increased agricultural production stimulated by the proposed facility. Instead, the main emphasis was on reduced operating costs to transport users--not only to present users in cases where

there was some sort of existing primitive road or track, but to future users as well. In order to estimate savings to potential users of the proposed facility, traffic forecasting was required. Thus, a central feature of many of the studies was an analysis of current and future demand for transport in the region to be served by the facility.

The method generally used in the surveys studied was, first, to estimate savings in transport costs. Broadly speaking, a cost savings estimate is computed by calculating reductions in wear and tear on tires and vehicles, lower fuel costs, and reduced labor costs.[7/] The savings are then compared with present operating costs. The savings estimate was then applied to forecasts of average daily traffic, in order to assess the benefits which could be expected from the new facility. Average daily traffic figures, in many cases, were based on estimates of growth in GNP and past traffic trends, instead of on projections of increases in agricultural and industrial production in the region to be served by the facility.

This technique of basing benefit estimates on reduced transport operating costs, combined with traffic forecasts, was borrowed from the

---

7/ Savings in maintenance costs are omitted here. It should not be assumed that maintenance costs are lower on an improved road than on an unimproved road.

United States and other developed countries. Such analysis is more appropriate in the United States and Europe, where improvements to existing highways generally involved benefits that accrue predominantly to users of the facility. The technique is less applicable in the developing countries, however, except in such cases as ports and urban roads where traffic congestion is already a serious problem.

In rural areas of underdeveloped countries, however, it is frequently a developmental or feeder road that is being studied for a region which is presently served by no road, except possibly a track. The principal benefits cannot be assessed in terms of savings to users since there are few or no present users. Benefits must instead be assessed in terms of the increases in real output which can be expected to result in part from the new facility. In cases where a road of some sort exists with a small amount of vehicle traffic, the main emphasis still must be on projections of increases in production, although this should be supplemented by estimates of reduced operating costs to present users. In other words, the primary beneficiaries will not be the present users in either case.

It should be noted that, after projections of increases in production are made on a commodity-by-commodity basis, these estimates must be translated into actual traffic forecasts in order to determine design standards for the road and to estimate future maintenance costs.

Estimating Increases in Real Output. A study of a highway system for a Central American country provided a rare exception to the absence of forecasts of increases in real output and to the gross inadequacies of traffic forecasts characteristic of most of the pre-investment studies. In this study, agricultural production over the next few years on a commodity-by-commodity basis was projected. The production projections were then broken down according to amounts which would be consumed locally and amounts which would be transported. Projections of output in the forestry and manufacturing sectors of the economy were also included. The quantities and kinds of commodities which would be produced were, in turn, based on estimates of local food requirements, population projections, estimates of future world demand for various commodities, suitability of soil and climate to various crops, and expected development of particular food processing and other manufacturing plants. The output projections were then translated into traffic projections which, along with extensive origin and destination survey data, were used to determine road location and design standards.

Total projections of freight and passenger volumes for the 10-year period were ultimately used in the sample benefit-cost analysis. Even here, many assumptions were required but the method was appropriate.

The Attribution Problem. One of the knottier conceptual problems arising in connection with estimating increases in real output is the so-called "attribution problem." One aspect of this problem is, briefly: how much of the increase in real output associated with a given project, such as a new highway, is attributable to the highway and how much to other investments? If there is an increase in agricultural output on land near the highway, this increase was stimulated not only by the new transport facility but also by certain investments in agriculture. In most of the feasibility studies all of the increases in output were attributed entirely to the new transport facility or a certain percentage was attributed on an arbitrary basis. This practice, as well as that of counting unquantified or illusory indirect benefits and financial (in addition to economic) benefits, helps to explain why the benefit side of the benefit-cost ratio was frequently overstated.

A general transport survey for a developing country "solved" the attribution riddle by counting as a highway benefit the full value of projected increases in living standards. The consultants recommended that, for each proposed road, the benefit calculation include the projected increases in income for all families living within 10 miles of the road and at the terminus, based on the monetary value of expected increases in the marketable agricultural production of the families. It was assumed that the full increase in agricultural production would be stimulated solely by

the road and that no other investments would be necessary to bring about a rise in production or in farm income.

Occasionally, project analyses avoided this problem by correctly considering a proposed road and associated development projects as one package. In one road project feasibility study, the benefits of the proposed roads were not separated from the estimated net income of the farms to be served by the roads. The net farm income for a 15-year period was estimated. Behind these estimates of the value of agricultural production were a number of basic assumptions as to the rate of colonization, the amount of marketable production, obtainable prices for agricultural products, the foreign exchange rate and the relationship of gross sales value to net income. The benefit analysis was one of "joint" benefits, subsequently compared with the cost of the farm scheme plus the estimated cost of the roads.

Estimating Benefits in Terms of Cost Savings. An example of the more typical method for estimating benefits found in the feasibility studies is provided by a study of three roads in one country. In this case, benefits were estimated on the basis of reduced operating costs. The steps of the analysis were as follows:

1. Estimates were made of average operating costs for main categories of vehicles on different types of roads. (Operating costs

included depreciation, repairs, fuel, lubrication, tires, and driver's salary.)

2. Weighted averages were calculated for vehicle operations on unimproved roads and on paved roads. The savings on the proposed roads were assumed to be identical with the difference of the two weighted averages.

3. The estimated traffic on each proposed road as expressed in number of vehicles per day (average daily traffic, or ADT) was reduced by a factor derived from an estimate of how many vehicles would travel the whole length of each road. How these average trip assumptions were arrived at was not explained. The adjusted figures then represented the number of vehicles traveling the full length of the road.

4. The estimated weighted savings per vehicle-kilometer for each road were multiplied by the adjusted average daily traffic data and the length of the respective roads, and projected on an annual basis for each year of the 20-year forecast period. The assumption that the traffic composition would remain the same over the 20-year period to justify the use of the weighted average operating cost saving of the initial year was explicitly stated. The assumption of identical trip lengths during the 20-year period was, however, not explicitly stated.

The classic problem of methodology illustrated by this example is that the consultants applied the cost savings figures not only to existing traffic but to additional future traffic as well. In this situation future

traffic estimates are used as substitutes for estimates of increases in real production. This is an inadequate measure because estimates of savings on traffic which did not exist before the road improvements do not necessarily reflect the real benefit from new production. The factors which should be taken into account are: (1) the amount of resources released by reductions in operating costs; and (2) the amount of additional output generated in part by the highway improvements.

Apart from this fundamental error, the study ran into trouble with such problems as estimating average trip length and projection of traffic composition over the next 20 years. On these matters, resort was made to arbitrary assumptions as to average trip length, which, of course, yield a wide range of annual vehicle utilization figures.

Absence of Stated Assumptions Underlying Projections. The matter of using arbitrary assumptions as bases for projections of various kinds leads directly to another persistent weakness in pre-investment studies as a whole. This was failure to make explicit the assumptions on which projections were based. Thus, in addition to depending on inadequate available data, projections were further weakened by the fact that the users of the studies could not follow the logic of methodology on which the projections were made.

Other Methods of Calculating Benefits. Conceptually, the method of estimating savings in terms of increased profits to truck operators is

very similar to that of making the calculation in terms of reduced transport rates. The basic difference between the two is that, in the case of the former, the savings are retained by the transport operators; in the latter, they are passed along to users.

The basic method used in determining this type of savings was: (1) to estimate what either the profits or rates would be after the road improvement was made; (2) to multiply this figure by a projected annual average traffic estimate. In virtually every study in which this kind of calculation was made, assumptions as to present rates or profits, future rates or profits, average length of haul, and average annual traffic were made on an essentially arbitrary basis. Very often, the bases for the assumptions were not elucidated.

Calculations of reduced rates or profit increases are not usually good benefit indicators. In the first place, whether the savings are retained by the transport operators or passed along to the users depends in large measure on the degree of transport monopoly or competition involved. If the situation is one of total monopoly or near monopoly, the truckers are likely to retain the savings as profits. If there is considerable transport competition, the saving may well be translated into lower rates. The problem here is that, in the latter case, it is very difficult to know whether or not all of the savings were in fact translated into lower rates. Furthermore, in cases where there are few or no effective restrictions on entry of new

trucking firms, it is hard to know whether the lower rates result from lower operating costs or from an increased supply of trucks in relation to freight offered.

Whether cost savings are retained as profits or passed along as rate reductions, the main point is that an estimate must be made of the effects that the savings will have on economic development.

A Special Case: A New Highway Parallel to a Railway. Occasionally, a pre-investment study of a proposed highway to be built parallel to an existing railroad is undertaken. In such cases, the savings benefit is estimated by comparing the projected operating costs of the highway with the present operating costs of the railway. Although such a comparison is theoretically conceivable, it is extremely difficult and complicated to carry out in practice. In order for the comparison to be valid, it is necessary, for example, to evaluate whether or not the present rail costs are "true costs"; existing rail rates cannot automatically be accepted as valid basis for comparison.

In one road feasibility study the relative benefits of the proposed highway were estimated as the difference between direct operating costs of providing services on the new highway and continuing to rely on rail service with various improvements. Certain variations of the two basic solutions were also compared.

A "freight benefit" was calculated as the difference in total operating costs of the two facilities. (The present rail costs were taken as given.) The result came out negatively for the road; the railroad solution was given the comparative advantage.

Subsequently, highway passenger benefits were computed at "about 20 percent of direct operating expenses by highway," which elsewhere in the report was estimated for heavy truck trailers. The relationship stipulated between the operating costs of passenger vehicles and truck trailers was not in any way substantiated. The passenger "benefit" per mile turned out, not surprisingly, to be the highest for the longest route, since it was based on a kilometer cost rate. No passenger benefit was computed for the railway solution, but the positive "road passenger benefit" was added to the negative road "freight benefit" to get a slim positive road benefit, termed "imputed benefit."

Nonmonetized Cost Reductions. Among the more serious errors in calculating benefits resulting from cost savings was that of attempting to assign values to nonmonetized cost reductions, such as time savings and accident reduction. In specific cases it may be possible to assign an accurate monetary value to savings resulting from reduced accidents or wage costs when transit times are reduced. In some of the studies, however, these categories were used to improve the benefit-cost ratio without evidence that the savings did exist.

Problems of Cost Calculations

As indicated earlier in this paper, the main weakness in estimating costs was underestimation. In only a few cases was it possible to find both original cost estimates and final costs for projects which involved construction.[8/] In case one (highway construction), the original estimate was $16 million and the final cost $27.4 million; in case two (highway construction), the figures were $19.5 million and $47 million; for case three (airport improvements), $1.5 million and $2.7 million; for case four (highway construction), $5.3 million and $8.0 million. (In the last example, the figures covered only the foreign exchange costs of the project.)

Omission of Cost Items. This chronic underestimation of the actual monetary costs was attributable mainly to the fact that in nearly every study, important cost items were omitted from the cost estimates. One of the chief omissions was maintenance costs. For example, one study presented estimates of the costs of construction of maintenance

---

8/ Most of the loans by U.S. aid agencies, until the last three or four years, were for transport equipment only, and not for construction of new or improved facilities. While a number of transport development loans involving construction have been made in the 1960's, these projects are not yet completed, so that it is impossible to obtain final cost figures. (Estimates for equipment costs, are, of course, quite straightforward.)

stations and repair shops and of the equipment needed for these shops, but it completely omitted these estimates from the benefit-cost analysis. Although rough estimates of maintenance costs over the first five years (instead of for the assumed life of the road) were included, the estimates were unsubstantiated and were much lower than per-kilometer maintenance costs for roads in a nearby country. Other omissions included "system costs," such as feeder roads and vehicles which have to be imported, and labor and administrative costs.

Not only were the monetary costs underestimated in the majority of the reports but the full economic costs were also usually underestimated. The attribution problem discussed earlier in regard to estimating benefits resulting from increases in real output arises again in connection with estimating costs. Many studies counted all or a large percentage of increases in output (agricultural output, for example) as a benefit attributable to the new transport facility. However, they seldom included the additional costs of increasing output--such as fertilizer, new farm machinery, or the services of agronomists and soil scientists--on the cost side of the calculations.

A common weakness in the cost estimates which may or may not contribute to the underestimation of costs, but certainly detracts from the practical usefulness of the estimates, was failure to present

costs in terms of quantities and unit prices. Instead, cost figures were commonly presented only in terms of the final figure, with no item-by-item breakdown. In some cases, the source of price quotations was not indicated. In one study, for example, prices appeared to be factory prices in the United States, rather than C.I.F. prices in the port of entry of the country for which the project was planned.

Overemphasis on Engineering and Cost Calculations. While the benefit side of the benefit-cost calculation is largely derived from economic analysis, the cost side is essentially based on engineering studies. One of the major weaknesses of the pre-investment studies was the lack of balance between the economic and engineering sections. In many studies, much more of the report was devoted to the engineering, or cost, aspects than to the economic analysis.

The reason for this is, possibly, that engineering techniques are more developed and straightforward than those of economics. If the reconnaissance study became an established part of project evaluation procedures, a good deal of the costly engineering studies could be eliminated. This preliminary report focuses on the economic aspects of a project, and a rough estimate of costs is all that is needed. Only those projects for which the reconnaissance reports came out with favorable economic recommendations would require an extensive engineering study.

Other Problems of Benefit-Cost Analysis

In estimating benefits and costs, two quesions invariably arise: What time period should be used in estimating the benefits--that is, how long will the benefit be expected to last? Over what time period will the costs be incurred? These questions were ignored in many of the studies. Occasionally, an arbitrary life expectancy of the transport facility was assumed, and, also occasionally, a rate of interest (usually the interest rate set by the loan agreement with the loan agency) was assumed. In only one case was the assumed time horizon and interest rate explained or selected on any particular basis. Yet, obviously, these two factors are essential to the economic evaluation of a project and alternative project possibilities.

One last weakness in the benefit-cost calculations in most of the pre-investment studies was the fact that they were expressed in terms of a ratio rather than in terms of a "gap" or difference between benefits and costs. Some items could well be considered as either a negative cost or a positive benefit (such as reduced maintenance), and how they are introduced into the fraction can have a substantial effect in the final ratio but no effect in a measurement of the difference or gap between benefits and costs. Finally, a ratio is not as meaningful as an absolute value figure. 9/

9/ For a full discussion on this point, see Harral, op. cit., p. 118 et passim.

CONCLUSIONS

The deficiencies of the present system of evaluating proposed transport projects are outlined below.

1. Project Justification

Many of the transport studies sponsored by AID in effect seek justifications of predetermined decisions as opposed to "evaluations" of meaningful alternatives. The former attempts to justify a particular proposal, ordinarily by demonstrating that benefits, measurable and non-measurable, exceed costs, that the ratio of benefits to costs exceeds unity. The latter seeks to choose a preferred plan from a range of feasible alternatives by evaluation and comparison in terms of specified objectives. In addition to estimating the benefits and costs expected from each individual project, good project evaluation answers two questions: "Why do anything?" and "Why this way?" The project justification criteria provide only necessary but not sufficient conditions for choosing projects and are inadequate for economic planning.

Of course there are various factors, such as legal obligations and past political commitments which can in fact predetermine certain projects. In these cases, the need for evaluating alternatives is less clear, although it can still be useful as an economic costing of political objectives. However, there can be no excuse for a narrowly conceived and poorly executed "project justification" for those projects to be assessed solely

or largely on the basis of their expected contribution to economic development or other specified objectives.

Fundamental deficiencies in the overall approach to project planning which originate in a bias toward project justification include the following:

a. Failure to carry out effective pre-appraisal. AID currently does not sponsor effective reconnaissance or pre-appraisal studies as a routine procedure in the sequence of steps by which projects are appraised. But it is very difficult for the agency to refuse support to a project once it has mounted a major research study of the scale of its present feasibility studies. In practice the agency often becomes committed to a project when it agrees to a feasibility study, and any opportunity to influence the decision at hand, in detail or in substance, is lost.

Furthermore, present feasibility studies encompass large inputs of preliminary engineering design work. This expensive work cannot and need not be undertaken for a wide range of alternatives.

Thus, the agency is reluctant to undertake a feasibility study until its own staff is convinced by their analysis that AID should finance the proposed project. However, the agency does not have the specialized and expert staff that can independently accomplish an effective appraisal of the complex range of technical alternatives for almost any given transport proposal. The result is that one particular alternative (or limited number

of alternatives) is "locked in" as the project at a premature stage. Often the only thing left for the expert consultants to do, as one disappointed official remarked, is to provide "a good study to justify a bad decision."

b. Narrowly defined study specifications. The contract specifications or terms of reference for the feasibility studies reviewed were often written in such a way as to limit the range of alternatives narrowly. Moreover, the wording of the specifications was often favorably biased toward the proposed project.

c. Biased format of the decision criterion. The decision criterion which AID specifies is that benefits of the project exceed costs over time. That this, and those more advanced variations of the benefit-cost ratio approach, constitutes a defective criterion was demonstrated several years ago in discussions of water resource development.[10/] There are many projects which satisfy this criterion which cannot satisfy other economic and social criteria.

Furthermore, the study revealed evidence of a strong tendency in practice to underestimate ultimate project costs and to overestimate probable economic benefits. The net effect, of course, is to reflect a favorable bias toward the particular project proposed.

10/ J. Hirshleifer, J. G. DeHaven, J. W. Milliman, Water Supply: Economics, Technology and Policy (University of Chicago Press, 1960), Chapters VI and VII.

2. Failure to Relate Proposed Project to the Economy

Undoubtedly due in part to the justification-oriented framework within which the studies took place, a characteristic of the feasibility studies reviewed was the lack of depth and perfunctory nature of the "economic analysis," in marked contrast to the specificity and detail of the average engineering analysis.

Frequently compiling available statistics for the country as a whole was substituted for marshalling logic and evidence to provide a formal case in support of the project. The arguments relating the given statistics to the proposed project were often naive or omitted altogether. There were few attempts to relate the proposed project to the overall transport network and to the natural resources, agriculture, industry, and private as well as public investment plans of the economy. Under these circumstances, efforts to determine the effects of the proposed investment and to compute its benefits were necessarily less than satisfactory.

3. Underestimation of Project Costs

While the current study was not able to investigate the matter in detail, underestimation of actual costs of construction was found to be a common characteristic of pre-investment studies. This occurred despite the detailed and expensive engineering reports in the studies.

Exhibit I

SURVEY FORMAT

1. Bibliographical Information.

   1.1 Author.

   1.2 Title (underlined).

   1.3 Publisher or Sponsor.

   1.4 Place and Date of Publication.

   1.5 Number of volumes, appendices, pages, bibliography (if any), typed, mimeographed, etc.

   1.6 Type of Report.

   1.7 Status of Report.

   1.8 Cost of Study, Financed by ? .

   1.9 Proposed Investment.

   1.10 Research Period - Field, Home Office.

   1.11 Important Contributors, Consultants.

Read by: File or Contract No.:

Date: Copy Obtained From:

(Above to be contained on first page for easy reference; remainder to begin on another page.)

(n.c. = not covered; implies criticism

n.a. = not applicable; does not imply criticism)

2. Related Reports (list exact references).

   2.1 Studies directly related to project, including preceding and succeeding reports.

   2.2 Background studies taken into account.

   2.3 Other references, research of interest; reviews, criticisms.

3. Data of Interest:

   (a) Typical road (rail, harbor, runway, etc.) construction and maintenance costs, in $ per mile or km., specify gravel or paved, number of lanes or tracks, possibly type of terrain; exclude major structures.

   (b) Typical freight rates (rail, air, road, water) in $ per ton-mile or ton-km.

   (c) Typical passenger rates, $ per passenger-mile or passenger-km.

   (d) Load factors, utilization factors of trucks, buses, etc.

   (e) Typical traffic volumes (in ADT = average daily traffic); specify proportion of trucks, buses, autos.

   (f) Other data of interest.

4. Identification of Policy Objectives, Terms of Reference, Instructions, Constraints, Prior Commitments.

   4.1 Specified by developing nation.

   4.2 Specified by sponsor.

5. The Study in Relation to the Whole Economy, the Social, Political, Institutional Environment, National Development Plan.

6. The Study in Relation to the Whole Transportation, Communications and Distribution System:

air, rail, water, pipeline and road transport networks; marketing and storage; telecommunications, power.

7. The Present Demand for Transportation:

how arrived at? traffic counts? origin and destination surveys? shipper and carrier surveys?

8. The Future Demand for Transportation:

how estimated? extrapolation of past trends? correlated with predicted GNP or population trends? derived from national development plan? resource potential? high and low estimates given?

9. The Existing Transport System.

9.1 Physical inventory:	road mileage, vehicle stock, route patterns, etc.
9.2 Economic information:	investment, costs and revenues, rates and tariffs, profits, degree of monopoly or competition, stability or instability in the industry.
9.3 Appraisal of technical and economic performance:	speed, reliability, important strengths and weaknesses of present system, technically advanced or not.
9.4 Institutional factors:	legal, regulatory, administrative, government policy, trade unions, personnel problems, training, management aspects.

10. The Proposed Future Transport System and Its Costs.

10.1 Physical description:	how much detail? where do technical standards come from? are technical alternatives considered?
10.2 Engineering cost estimates:	how inclusive? are capital investment as well as maintenance and operating costs included? are roads as well as vehicles, airports as well as aircraft, etc. considered? are complementary investments taken into account, for example, highway as well as warehouses and harbor costs? are high and low estimates given? is derivation of engineering cost estimates, from quantities and unit costs, shown? general documentation and technical support for cost estimates good?
10.3 Consideration of alternatives:	are alternative project proposals, involving different locations, different technical solutions, different time patterns and sequences, different engineering standards, considered?
10.4 Final technical recommendations:	are they firm? well supported by analysis and technical evidence? can they be followed without further study by sponsors of study and developing nation?
11. Benefits:	how estimated? documentation? technical and economic evidence? what categories are included in benefits? monetary? role of user taxes in benefit assessment? non-monetary? vehicle operating cost savings? broad national benefits? social, political, etc. aspects?

12. Investment Analysis.

12.1 Identify investment methodology and criteria used:	benefit-cost ratio? maximization of net benefits? other?
12.2 Treatment of time and interest:	length of planning horizon? what interest-rates used? salvage values of assets considered?
12.3 Comprehensiveness of analysis:	different technical alternatives considered? how many? different investment patterns over time studied? priorities? stage construction? project postponements? systems effects? investment sequences analyzed?

13. Financial Analysis of Proposed Expenditure Program.

13.1 Schedule of financing:	amount, type and time pattern of necessary funds shown? Information given on: (a) domestic versus foreign funds; (b) current financing versus credits; (c) terms of proposed loans or grants (source, interest rate, period of grace, service charges, rates of repayment)?
13.2 Tax generation:	user financing, proposed user tax rates (fuel tax, license fees, import duties, sales taxes, other); other government revenues generated by program.
13.3 Broad fiscal and economic implications of proposed program:	effect on GNP, level of prices, tax capacity, domestic and foreign indebtedness, financial demands of other public and private sectors.

14. Implementation: administration, organizational recommendations, legislation, regulatory measures, manpower requirements, management aspects, recommendations for further studies?

15. Evaluation of Report.

15.1 Balance: between engineering and economics? data collection and analysis? past and future? analysis and action recommendations?

15.2 Does it follow current AID Manual?

15.3 Outstanding strengths and weaknesses: in field work? methodology? documentation? engineering aspects? economic analysis? benefit assessment? cost estimates? transport demand forecasting? investment analysis? financial analysis? choices put forward? action recommendations? implementation?

15.4 General assessment of study: complete? honest? excellent? very good? good? mediocre? poor? very poor? If you were the decision-maker, would you invest money on the basis of the evidence presented in the report?

EXHIBIT II

TERMS OF REFERENCE FOR EAST AFRICAN ROAD PROJECT

"With the objective of ascertaining the economic feasibility of the proposed 'X' road, the Contractor will (a) place emphasis on the collection of data and evaluation of economic conditions and potential of the areas to be served by the proposed route; (b) assess the proposed route and the natural segments of the route in terms of national development prospects taking full account of all communication facilities under construction or planned; and (c) provide the degree of analysis and evaluation of the foregoing which will produce monetary benefits to 'Y' for segments of the route."

After a section on cooperation with the local authorities and the local AID mission, the terms of reference continue:

"In performing the economic feasibility survey the Contractor shall develop the following information:

1. Effect on Development in Project Area

(a) General description of the area to be served by the proposed 'X' road (physical and economic geography, including agriculture, processing, manufacturing, centers of population, topography, geology, vegetative cover, and climate as related to traffic generating economic activity).

(b) Estimate of volume of exportable surpluses of commodities available in the area and requiring transport to outside markets.

(c) General economic effect of additional commerce on the area anticipated as a result of the proposed 'X' road.

2. Position of Project in Overall Program

(a) Present highway system in the area.

(b) Present transport systems other than highway (rail, air, water, pipeline, etc.).

(c) Extent to which inadequacies of transport in the area are retarding economic growth.

(d) National program for highway development and priority of the proposed 'X' road within the program.

3. Relation to Other Transport Systems

(a) Present distribution of traffic among the various types of transport in the project area.

(b) Anticipated effect of project on such distribution and on economics of other transport systems.

(c) Relative availability of vehicles, operating personnel, fuel, servicing, etc.

(d) Estimated or actual comparable transportation costs for the various systems.

4. Anticipated Economic Benefits

(a) Increase in special tax receipts (gasoline, road and bridge tolls, local customs duties, etc.).

(b) Increase in general tax receipts, which will result from increased economic activity.

(c) Reduction in transportation costs, including vehicle operating and maintenance costs.

(d) Increased income to the area served.

(e) Lower costs of other planned development projects which will be served by 'X' road.

(f) Gains by opening new lands for settlement by outside population presently unemployed or underemployed.

5. Present and Future Traffic Generating Activities

(a) Size, distribution, and economic activities of the population.

(b) Nature and tonnages of cargo imported into, exported from, and passing through the area.

(c) Schools.

(d) Population trends.

(e) New types and amounts of traffic expected to develop as a result of the project.

(f) Projections of present traffic without and with the proposed project.

6. Traffic Capacities

(a) Theoretical capacity of present highway system in the area (number of vehicles, tonnage, and maximum loads).

(b) Present use of highway system (based on traffic counts or other means of estimating).

(c) Estimated future use for a twenty (20) year period.

(d) Relation of present and estimated future use to present and future theoretical capabilities.

7. Justification of the Scope of Improvement

(a) Skilled and unskilled labor, including 'trainability.'

(b) Technical and supervisory personnel.

(c) Major construction materials--cement, aggregates, water, base course materials, steel, pipe.

(d) Housing, food, fuel and lubricants, repair shops, etc.

(e) Suitable sites for construction yards or camps.

(f) Description of 'Y' to provide the necessary level of maintenance for new highway when completed.

(g) Ability of 'Y' to provide the necessary level of maintenance for new highway when completed.

(h) Availability of equipment and trained maintenance personnel.

(i) Plan for recruiting and training.

(j) 'Y's' ability to finance additional maintenance work, and plans for providing funds at proper time."