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**Engineering and Economic Analysis
and Management
of Capital Projects by AID**

by
F. Donald Genova
Edmond C. Hutchinson
Ronald C. Wakeford
Paul W. Kolp



Research Analysis Corporation

McLean, Virginia

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SUMMARY

In September 1967 the Research Analysis Corporation (RAC) undertook a small research contract from the Agency for International Development (AID) to investigate the engineering aspects of the AID capital projects assistance process (AID Contract CSD/1873). RAC completed this effort by highlighting a number of deficiencies in the process and by proposing an alternative process that would reduce redundancy and ensure economy of effort.

AID subsequently awarded RAC a second contract (CSD/2172) in July 1968. The objectives of this contract are two fold: first, to refine the alternative process defined in the first task by further examining the economic as well as engineering inputs required in the process; and second, to help provide AID with draft-form issuances reflecting the new process.

Early in the study it was agreed that a new Project Appraisal Manual, replacing the old "Feasibility Studies, Economic and Technical Soundness Analysis, Capital Projects," Manual Order (MO) 1221.2 should be developed. This new Manual was to describe the engineering and economic inputs required by the new process. AID was to produce the draft chapters and RAC was to review and comment upon them in terms of conformance with the new process. Subsequently, two draft chapters, i.e., Electric Power and Water and Sanitation, were prepared by AID and reviewed by RAC.

This report presents (a) the Alternative Capital Projects Assistance Process, (b) a discussion of the differences between the

alternative process and the existing process, and (c) the comments on the AID-developed draft chapters for the Project Appraisal Manual. Included in the discussion of the two processes is a step-by-step comparison of the decision points and the findings required for each, an illustrative example of how a typical project will progress through the new process, and a suggested Introduction for the Project Appraisal Manual which will replace the Feasibility Study Manual (MO 1221.2).

Chapter 1

ALTERNATIVE CAPITAL PROJECTS ASSISTANCE PROCESS

AID may become involved in the process of considering capital project assistance at different stages in the development of project assistance. This involvement may be in the stage before there has been any identification of the general economic need (by country or sector) through the evolutionary phases of project development, or it may be in the consideration of construction loans for fully designed and planned individual projects. Further, the process of project development does not necessarily proceed in discrete stages entirely separable in content and time. Instead, there is often an interrelation in content and an overlap in time. Nevertheless, the decision process involved in considering capital project assistance is logically a sequential one, which should involve specific "go, no-go" decisions in phased relations. The division of the process into its logical steps is useful for analytical purposes, but more importantly, it provides a basis for the phasing of inputs specifically related to decision making and allows for economy of effort. At the conclusion of each step or phase, a major decision-making point is reached as to whether or not to proceed with the next stage of the process. If the decision is to proceed, the scope and detail of the next stage must also be outlined at this point.

A process of capital project assistance seems logically to consist of the following five stages: (1) identification of economic function possibilities, (2) project definition and preliminary appraisal,

(3) project design and final appraisal, (4) project implementation, and (5) project evaluation. Figure 1 shows the various stages and decision-making points in such a process, and Figure 2 indicates where it fits into the overall AID economic assistance process.

Identification of Economic Activities or Function Possibilities

Before AID begins consideration of capital assistance to a particular country or institution it must, of course, decide whether the country or institution is one to which it is prepared to allocate resources. It should also decide the extent to which it is prepared to provide such assistance in terms of how far through the process it is prepared to provide support, e.g., is it prepared to eventually finance project construction, to finance only sector studies, or to finance some intermediate stage? How far AID is prepared to go with project assistance may, of course, vary from project to project, but before undertaking the process at all it should be known whether AID strategy with respect to the country concerned places a limit on the type of capital assistance AID is prepared to provide.

Once these decisions are made AID may become involved at any stage of the process consistent with such decisions. AID may also become involved in the process in a number of different ways. Frequently the process will be stimulated by an informal request from the host country for one or more specific project loans. This request could have been initiated with minimal, or no, prior consultation with, or assistance from, AID and may be based upon little economic information and analysis.

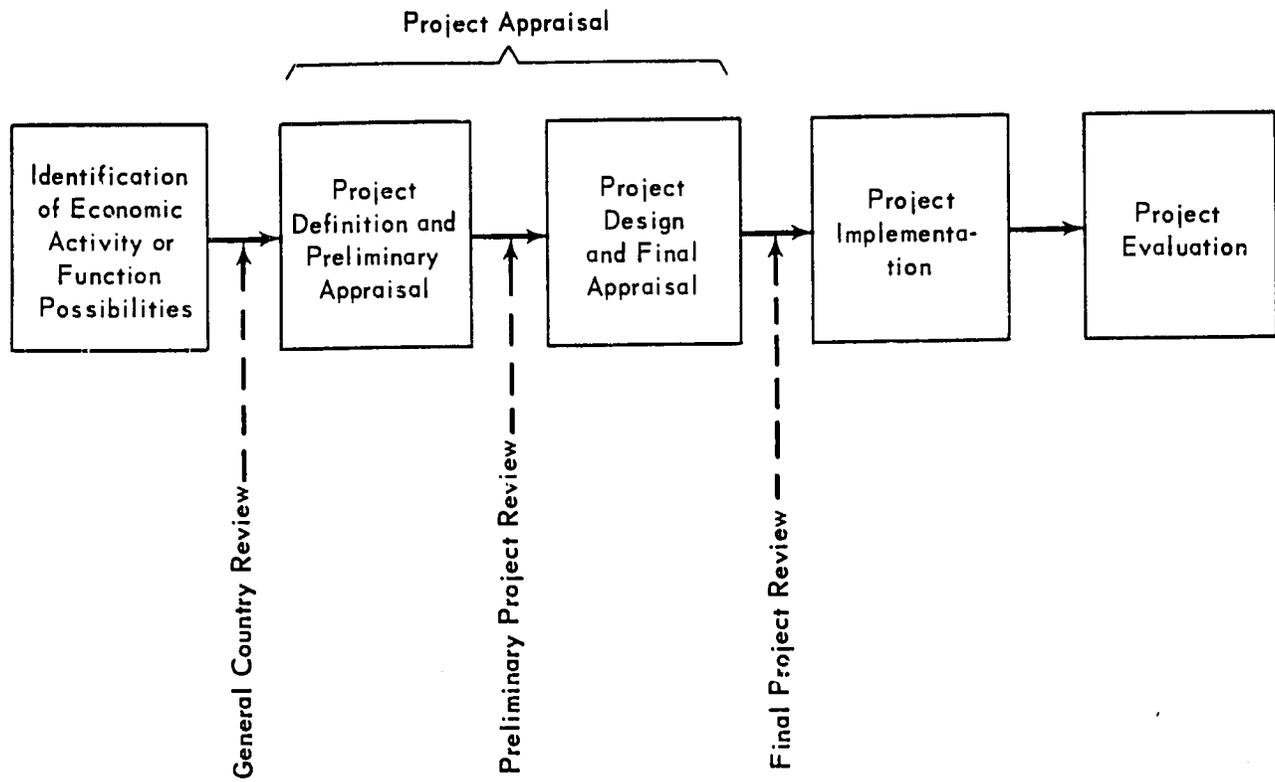


FIG. 1—A.I.D. CAPITAL PROJECT LENDING PROCESS

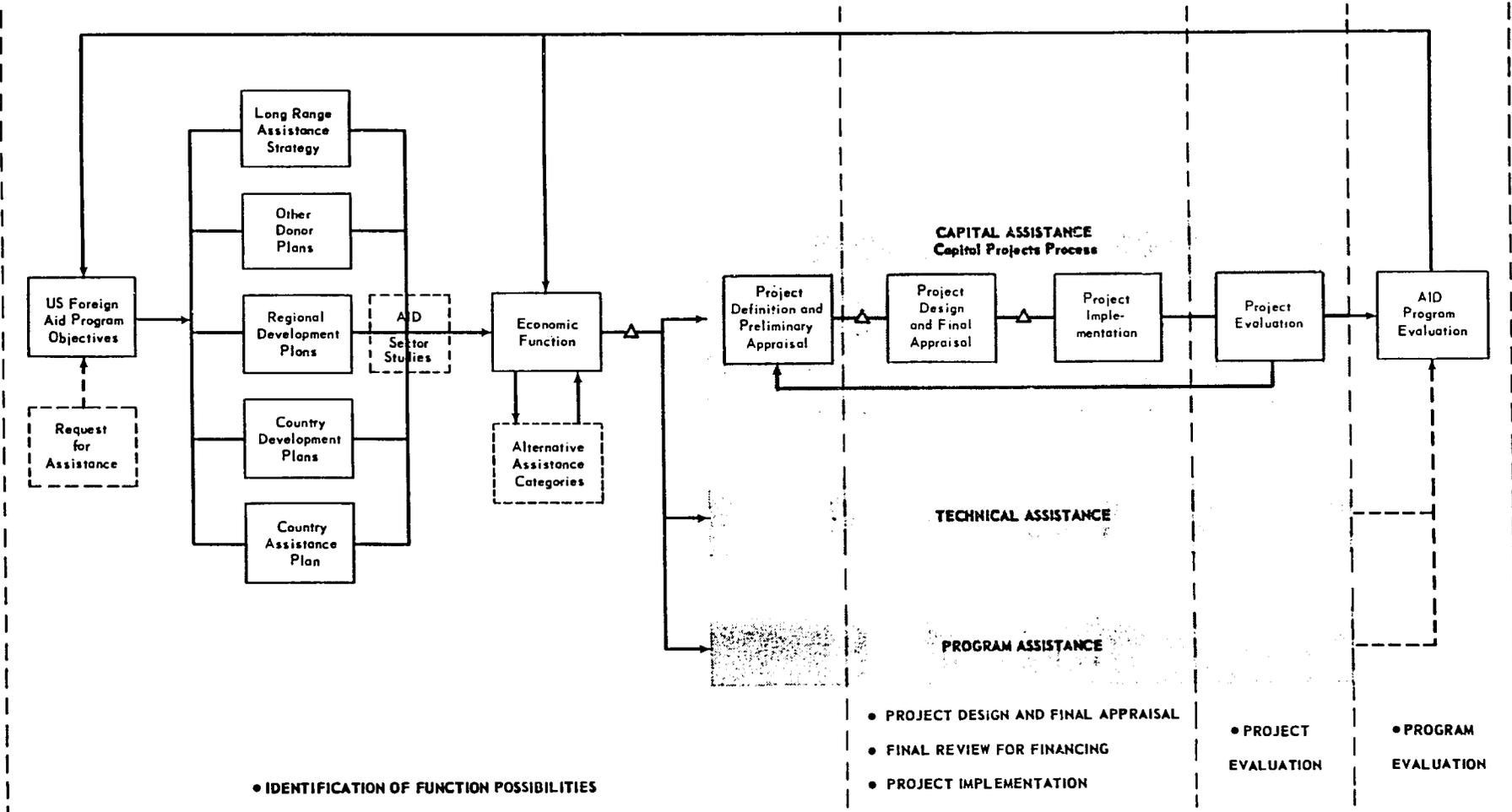


FIG. 2—AID ASSISTANCE PROCESS

Δ Indicates decision point.

Alternatively, a request for assistance may be based on the results of a sophisticated approach to sector planning for establishing project priorities and may develop out of both a continuous dialogue between the mission staff and host government officials, and exploratory discussions between the host government officials and various international lending agencies. Where a coordinating organization exists, the country may periodically present its development plans and external assistance requirements to this organization. Out of such meetings may come a general understanding of the priority needs of the country and preliminary commitments by the lending agencies in consortium or separately to provide assistance for specific programs or activities.

Regardless, however, of the stage or manner in which AID becomes involved, the first task is the selection of economic functions to provide the basis for determining whether basic economic and technical considerations, and the country's financial, economic, and institutional infrastructure, justify the definition and (as a minimum) preliminary appraisal of a specific project or projects.

In undertaking such a task, a decision should be made that, if assistance from other donors is not available and the country is unable to proceed without assistance, AID is prepared to provide assistance in connection with the selection of economic functions to be analyzed (e.g., the financing of a planning activity, a sector study, or similar basic economic analysis of a country). In principle at least, AID may then be prepared to assist in financing the definition of a specific project, its final planning, design, and eventually its construction. The specific

and crucial decision that must be made at the end of this first phase is whether AID is prepared to provide assistance in connection with the definition of a particular project.

During this phase of the process, the review and analysis is not directed toward a particular project but is intended to do one of two things; (a) identification of economic functions most likely to offer feasible opportunities for fostering the highest rate of economic growth, (consistent with national host country objectives) and for carrying out the AID assistance strategy* or (b) to determining whether a particular project which has been proposed performs such a function. This review provides a means for selecting possible economic functions that can provide the bounds within which projects can be recommended for further analysis in the form of in-depth project appraisals. Such a task does not require any formal findings of economic or technical feasibility of the function. Instead, all that is necessary is the judgment that a function is technically feasible and is within a country's capability to bring into being (with such help as may be appropriate), and that the economic return potential is great enough to warrant further detailed investigation of the facts.

The following information is necessary to permit the analysis and decision required:

(1) Nature of the economy and its resources and where its comparative advantages seem to lie.

*Emphasis is on the economic function, such as providing electrical energy in Region A, rather than on a particular project to accomplish this activity.

(2) Basic macro-economic data such as:

(a) GNP

(b) Distribution of income

(c) Balance of payments and trade statistics

(d) Country's debt servicing requirements.

(3) General demand and supply situation with respect to any products to be involved in projects for performing the identified functions.

(4) General information as to the size of activity operations required for economical operation.

(5) Information concerning any special situations likely to raise serious technical problems.

Judgments on whether technical problems are likely to be insurmountable can be made by an engineer with knowledge of the country on the basis of a description of the activity that identifies its purpose and product, its proposed size and capacity, and where it is to be located. The same kinds of judgments by competent and knowledgeable economists are possible on the economic side based on the country plan, prior studies or surveys, or knowledge of the economy and the type of activity being considered.

It should be recognized that more sophisticated analyses and information may already exist from the data submitted with project financing operations, sector surveys or studies, other macroanalyses (from World Bank or other studies), or national development plans and budgets. In such case, activity in this phase would consist largely of review of the data available, already stated economic activity priorities,

and of the analysis upon which priorities are based. This would then lead to a decision on whether to proceed with the formulation and preliminary analysis of an individual project.

Decision Step (General Country Review)

A decision must be made at this point as to whether to go ahead with a further analysis of economic functions and related projects. It is possible, for example, that the identification stage would isolate potentially promising economic functions unrelated to the initial host country project loan request or functions for which AID was unable to provide sufficient financial resources.* The essential point is that both AID and the host country must mutually agree that further analysis of the suggested economic function is worthwhile.

Project Definition and Preliminary Appraisal

Given a decision to proceed, the next step in the process is the formulation of a specific project and the development of economic, technical, financial, and institutional data in sufficient detail to permit a judgment as to whether proceeding with final design and planning and with construction (unless firm cost estimates based on final designs and specifications made the project uneconomical) is justified. However,

*It is also possible that under certain conditions a recommendation would be made to provide technical assistance (for work on a specific economic function or on more general national or sector planning) rather than capital assistance.

a final decision to proceed with construction is not to be made at this stage and section 611 requirements with respect to financing construction are not required in this phase of the process. In other words, the basic purpose then is to lay out the parameters of a specific project and to arrive at an estimate of its benefits and make a judgment as to whether a technically sound project can be designed and constructed within the limits of costs imposed by the benefits. A second purpose is to identify any legal, institutional, financial or other problems which must be resolved to permit the carrying out of a successful project.

The first task in this stage is to identify broad alternative methods of accomplishing a particular recommended economic function (whose purpose has previously been made explicit). It is then necessary to evaluate these alternatives as a means of isolating the most economically promising project or projects (consistent with host country national and sector objectives). As an additional means for choosing the most promising alternatives, sufficient consideration should be given in this preliminary appraisal study to the financial, manpower, institutional legislative, and managerial requirements of each project and to the means for achieving these requirements. Once the specific project is defined, the task becomes that of defining as precisely as possible the benefits to be derived and an order of magnitude cost estimate.

The envisaged steps in this stage (some of which could be carried out concurrently) of the capital assistance process are as follows:

- (1) Consider alternative projects for accomplishing the economic activity.

(2) Evaluate alternatives with emphasis on determining economic benefits.

(3) Evaluate the host country's institutional capability to implement, manage, operate, and maintain the project.

(4) Attempt to identify any legislative considerations of the host country that might impede progress of the project.

(5) Identify any unusual technical engineering problems likely to be encountered in project implementation.

(6) Provide order of magnitude cost estimates, based on standards, rules of thumb, past experience with similar projects, etc. of the various alternative projects.

(7) Develop benefit-cost analysis for project alternatives, outline crucial parameters in the analysis, and where appropriate, demonstrate the usefulness of sensitivity analysis in benefit-cost determinations.

(8) Perform an appraisal of financial, manpower, managerial, and legal requirements for project alternatives and estimate the capability for achieving these requirements and the constraints to their achievement.

(9) Choose the most promising project for accomplishing the specific economic function and the more general national, regional, or sector objectives. This would generally be the project which apparently is technically feasible, financially and managerially sound, and offers the highest economic returns (above a minimum acceptable level) to the host country.

(10) Develop definitive benefit estimates for the project chosen.

(11) Prepare order of magnitude cost estimates.

(12) Develop specific plans for the detailed design and final engineering of the project, including plans for financing of final design and engineering and for dealing with financial, legal, and organizational matters essential to a successful project.

Economic and benefit analysis of the specific project at this stage should be definitive and in depth since a decision is being made as to whether to go ahead with final design and engineering. Engineering inputs on the other hand should be relatively limited and directed toward a judgment as to whether there are likely to be serious technical problems involved in the project and to order of magnitude cost estimates. They should include: consideration of the present status of the project (if applicable); the planned capacity and anticipated output over time; the tie-in with transportation systems; requirements for and the source, availability, costs and reliability of utilities, raw materials, construction materials, and manpower; preliminary operating and organizational plans; and a proposal for obtaining the engineering services required in the project design and final appraisal stage. They would not include construction and funding schedules or construction plans.

Decision Step (Preliminary Project Review)

At the completion of the preliminary appraisal study it is again essential for the host country and AID to mutually agree whether a

particular project merits further consideration for potential implementation. Normally, however, only if implementation is anticipated (subject to available funds) should one proceed to a final appraisal. This perhaps, the most fundamental decision in the whole process.

AID economists would review the preliminary appraisal study to judge whether the economic analysis is adequate to justify study conclusions and recommendations. An AID engineering review would make a judgment as to whether the project as defined is likely to encounter insurmountable technical problems and to be accomplished at a cost within the limits of order-of-magnitude estimates.

A decision would then be made as to whether to proceed to financing of detailed design, engineering, and final appraisal.

PROJECT DESIGN AND FINAL APPRAISAL

Activity during this stage of the process is directed toward a decision as to whether construction of the project should be financed and toward having developed the project to a stage whether its implementation can begin immediately following a decision to finance construction. It is during this stage that the final Section 611 and other statutory findings are to be made. Emphasis at this stage is on detailed design and final engineering of the project, preparation of specifications, final cost estimating, and development of specific plans for project implementation, including financing, construction, and operation.

The steps in this phase (some of which are overlapping and many of which should be carried concurrently) include:

(1) Analysis of engineering design alternatives, final engineering and detail design of the project, and preparation of specifications.

(2) Review of final design and specifications.

(3) Preparation of a final estimate of cost.

(4) Review of the previous analysis of benefits.

(5) Final cost-benefit comparisons.

(6) Complete financial, manpower, legislative, and other institutional analyses of the project, including; (a) a projection of financial flow and assurance that financial obligations can be met, (b) an assessment of the effect of existing legislative enactments and recommendations for legislation where necessary, (c) the projection of staffing and managerial requirements and appropriate plans for meeting these requirements, and (d) an assessment of other institutional capabilities with appropriate recommendations necessary for accomplishing a successful project.

(7) Preparation of a construction program outline and completion of funding schedules (these engineering inputs as defined in M.O.'s).*

(8) Preparation of necessary loan agreements and letters of implementation.

*A question arises at this point as to whether this stage should extend to preparation of bid documents and actual receipt of bids as the best way of arriving at a firm cost estimate. The logic of the situation seems to be that a finding of economic soundness and technical feasibility should be made before the project goes to bid. On the other hand, bid prices have so frequently exceeded estimates, even those based on final plans, as to suggest that actual bids may be required. Probably in practice the point of finding should vary from case to case depending on the confidence in estimate, which might vary by country, type of project, etc.

Decision-Step (Final Project Review)

This is the final decision-making step before project implementation. The decision must be made whether to fund the project or not, and if capital financing is approved the host country must also agree to project funding and loan conditions.

This step should consist of a general AID review where all necessary revisions to the study findings are completed, all analysis and reviews are completed, the Capital Assistance Paper is completed, a determination is made of the amount of assistance required, final approval is given for financing, and implementation letters and financing agreements are prepared.

If concurrence is received from the host country on the terms of the agreement, a decision should also be made on selection of the A&E firm which would be responsible for preparation of bid documents, evaluation of bids, and construction supervision. If an A&E firm were used in the project design and final appraisal stage, minimal delay is likely to result when this same firm is allowed to be responsible for these activities.

PROJECT IMPLEMENTATION

Generally this phase should include preparation of bid documents (exceptions suggested previously in a footnote), receipt and evaluation of bids, award of the construction contract, opening of letters of credit and completion of other financial arrangements, meeting of conditions precedent, and actual construction. AID activities should consist of the necessary engineering reviews and monitoring of construction performance.

PROJECT EVALUATION

The final stage of the process is the appraisal of results. This appraisal should be in terms of evaluation of the validity of the analysis and planning of the project as tested by the actual implementation and operating experience. It should be in terms of an appraisal of the process itself and the validity of the techniques employed and of the results of the project in terms of costs and benefits as comparable with those anticipated. Reasons for difficulties and for shortfalls in anticipated results should be made explicit. A system of reporting for this purpose should be structured into the project implementation requirements and responsibility for analysis of reports and for recommending changes in procedure and methods based on that analysis should be fixed in an appropriate organization within AID.

Such a system of results and experience appraisal and evaluation should provide the basis for measuring the success of capital project activity in accomplishing objectives and for the continuous improvement of policies, procedures, and analytical methods.

Chapter 2

COMPARISON OF ALTERNATIVE PROCESS WITH THE EXISTING PROCESS

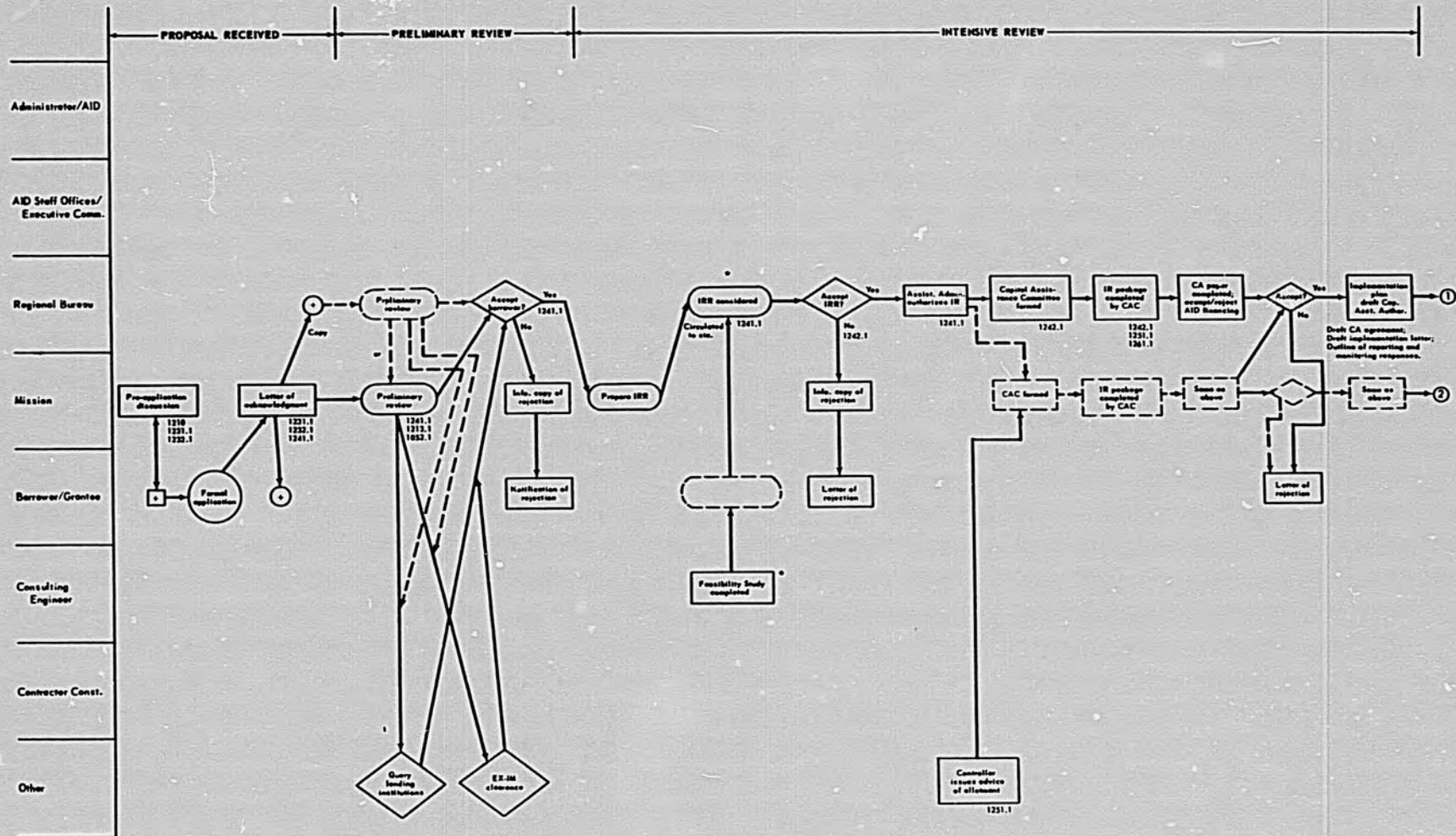
INTRODUCTION

The first two sections of this chapter describe the essential differences between the existing AID Capital Projects Assistance Process as defined in the M.O.'s and the Alternative Capital Projects Process as described in the preceding chapter. Although the required work is similar in each of these processes, the timing of the funding decisions and the informational content of the data required for these decisions differ.

The last part of this chapter presents an example of a typical project progression through the alternative process and a draft Introduction to the Preliminary Appraisal Manual that would be required to implement the alternative process.

EXISTING CAPITAL PROJECTS PROCESS

The purpose of the existing process is to: (a) analyze the technological feasibility and economic soundness of a project; and (b) provide for its design and construction. Where the project comes from, or how it was conceived is not rigorously defined in the M.O.'s. The process has two funding decision points that require engineering and economic inputs: the decision to finance the feasibility study and the decision (based on the results of the feasibility study) to finance the design and construction of the project. The second decision point is critical in that it irrevocably commits what is frequently millions of U.S. Government dollars to a long term undertaking in the host country. The existing process and the inputs required for its implementation are shown in Figure 3.



* Feasibility Study requires:

- a. Applications MO 1231.1
- b. Feasibility Study Application MO 1234.1
- c. Capital Assistance Preliminary Review MO 1241.1
- d. Intensive review request is NOT required (MO 1241.1)
- e. Capital Assistance Paper MO 1242.1

- f. Capital Assistance Authorization MO 1251.1
- g. Capital Assistance Agreement and Implementation Letter MO 1262.1, 1263.1
- h. Publication notice and request for technical proposal for engineering services
- i. Select consultant
- j. Negotiate contract
- k. Approve and execute contract

NOTE: Dotted lines indicate alternative routing determined by dollar value involved.

FIG. 3—EXISTING CAPITAL PROJECTS ASSISTANCE PROCESS

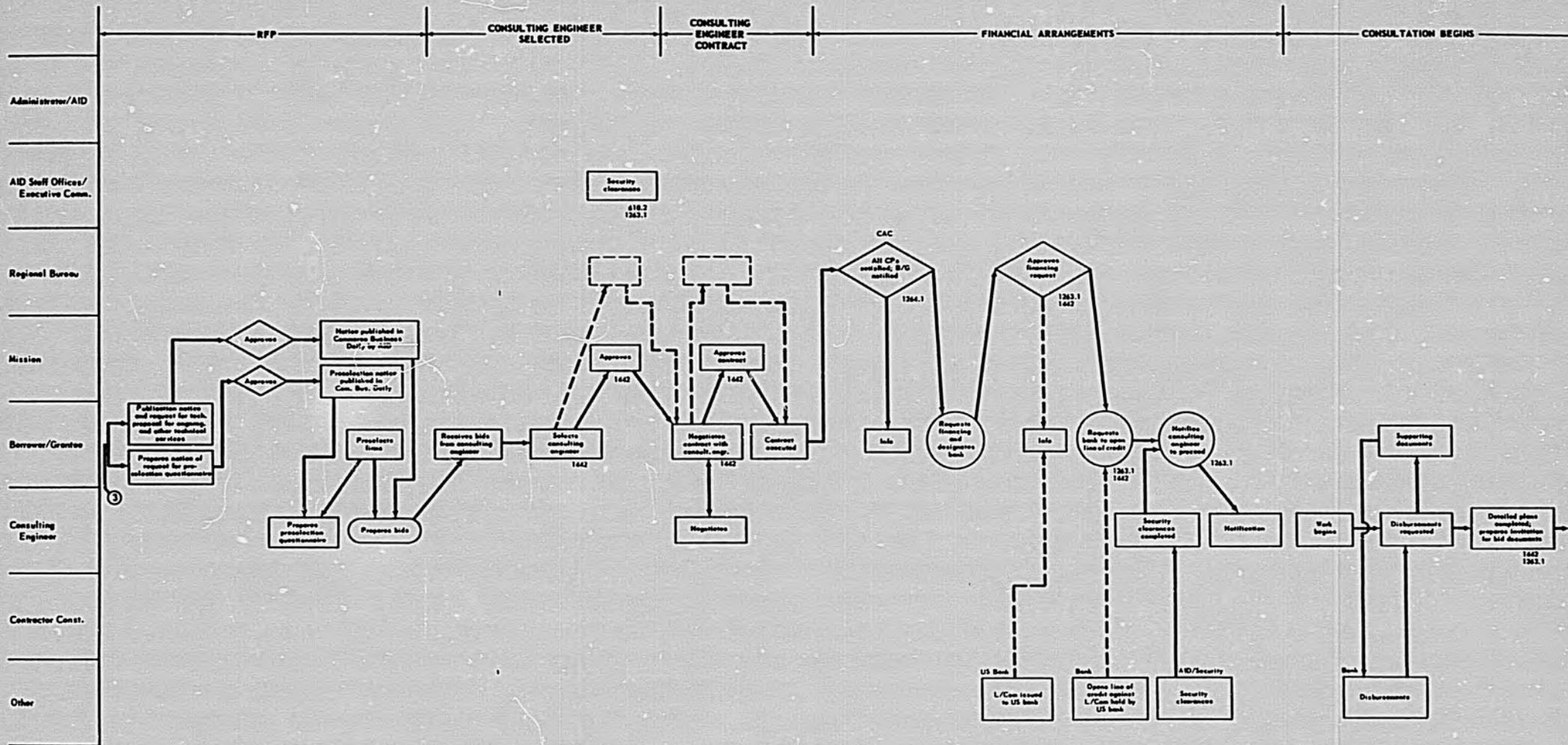


FIG. 3—continued

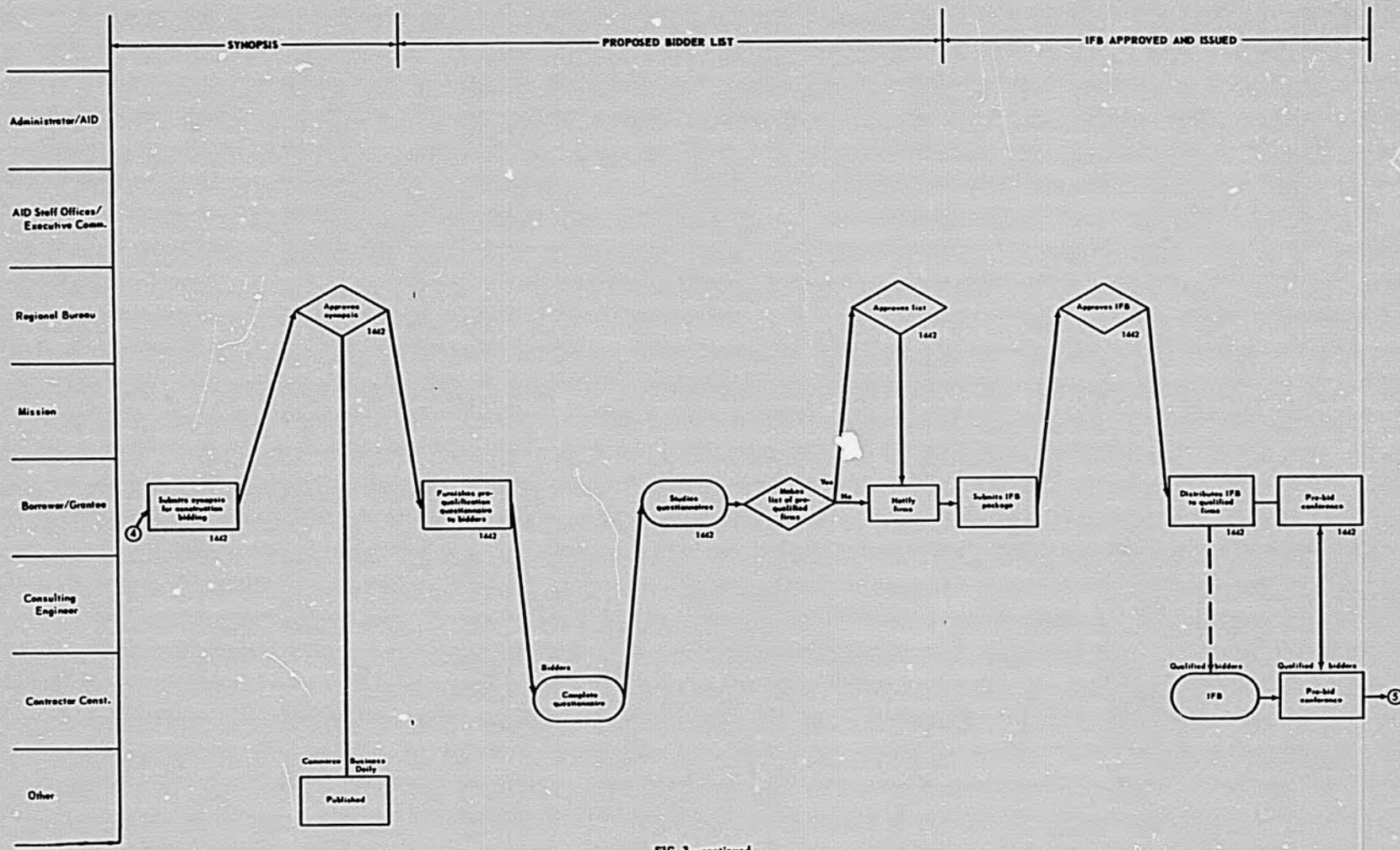


FIG. 3—continued

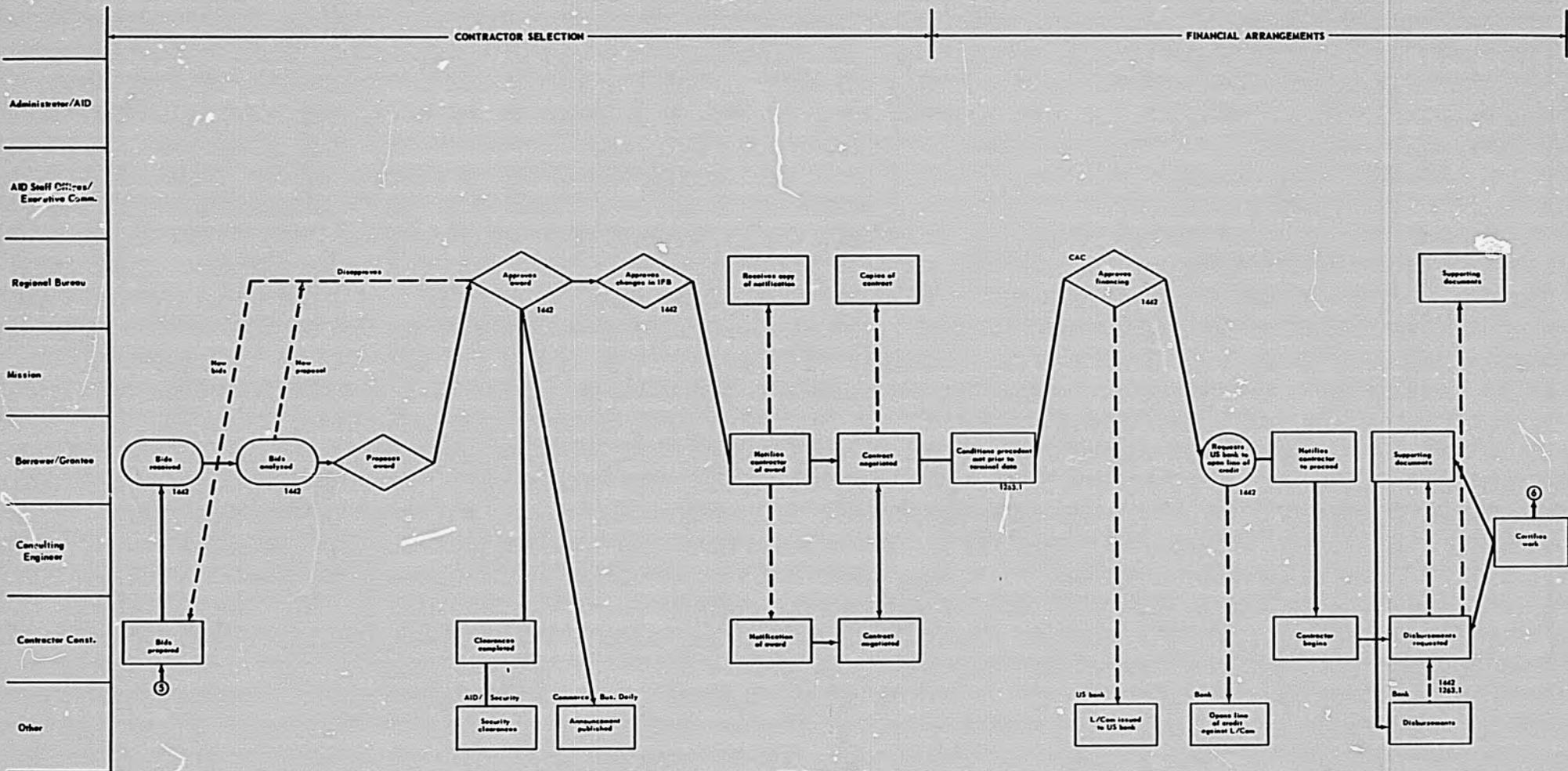


FIG 3—continued

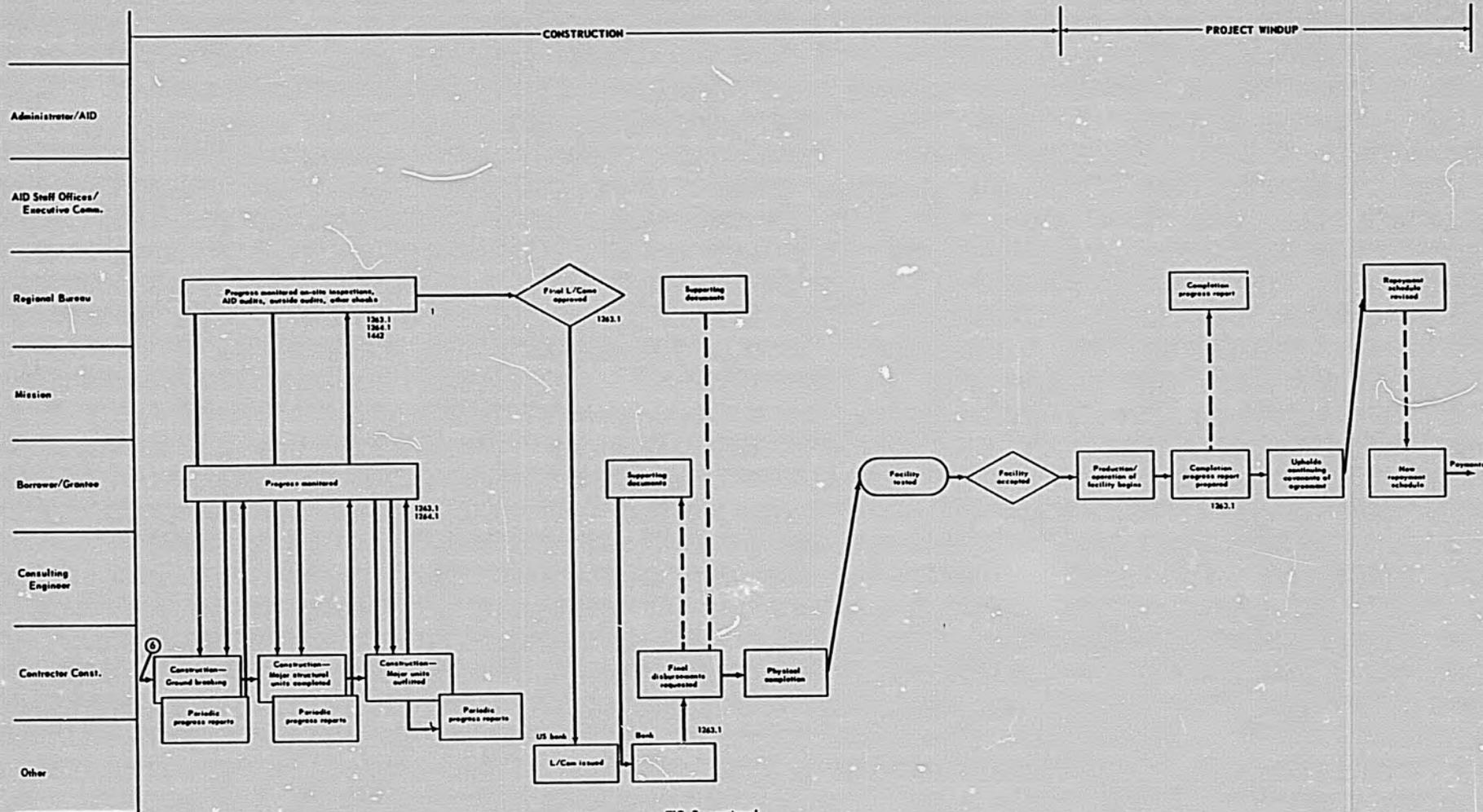


FIG. 3—continued

The weaknesses in this process are the following:

(1) The criteria for project selection are not described in the M.O. system and the projects themselves do not necessarily evolve as the result of a thorough country economic study.

(2) The decision to commit the U.S. and its money to a long term commitment is made far too early in the process. The uncertainty for cost estimates and the year(s) taken for design between the commitment of funds (at the conclusion of the feasibility study) and actual construction contribute too much uncertainty to the feasibility study estimates of construction costs, thereby invalidating some of the calculations in the feasibility study, particularly if the benefit cost ratio were close to 1.0. Because capital costs are usually a significant portion of any total cost calculations and because these capital costs are generally discounted at the beginning of the project, any errors in construction costs estimates often heavily affect the results of benefit-cost analyses in any feasibility study.

(3) The work required by the M.O.'s for feasibility study results does not have the proper timing and emphasis. The costly heavy engineering effort currently being performed in the feasibility studies is more than is required for a rough estimate of probable maximum cost for comparing with benefits and is insufficient to permit a really "reasonable" firm estimate of cost. The economic input on the other hand is frequently not sufficient early enough in the process to establish the limits of costs within which the project must be designed in order to meet the test of economic feasibility. Similarly, there is a requirement for rather detailed construction planning before the project has progressed to final design.

ALTERNATIVE CAPITAL PROJECTS PROCESS

The alternative process alleviates the shortcomings of the existing process. By providing three funding decision points instead of two, and by changing timing of the funding and the informational content of the inputs required for each of these decision points, a more logical process with better decision making information is presented. The principal advantages are the following:

1. Recognition of the need for a strong economic analysis of the host country integral with the project identification stage.
2. Full economic analysis of the specific project during the early phase and before undertaking a heavy engineering effort. This transfers the engineering effort to the Final Appraisal/Project Design phase.
3. Postponement of the decision to commit construction funds (typically 90 to 95 percent of the total cost of the project) until as close to the construction phase as possible and a more reasonably firm cost estimate.

Table 1 outlines the decisions that must be made in any logical development process and the findings required for these decisions. Table 2 presents a comparison of how the existing process and the alternative processes handle the timing of decisions.

EXAMPLE OF PROJECT FLOW THROUGH THE ALTERNATIVE PROCESS

This section describes the progression of the "typical" project through the alternative process and clarifies the meaning of "alternative."

Table 1

DECISIONS AND FINDINGS

| <u>Decision</u> | <u>Findings Required</u> |
|--|--|
| 1. That an attempt will be made to identify function or functions appearing to need to be performed. | <ol style="list-style-type: none"> 1. Country eligible or not eligible for assistance. 2. Probable function eligible or not eligible for assistance. 3. Probable function consistent or not consistent with aid strategy. 4. Appears <u>prima facie</u> that probable function may or does not need to be performed. |
| 2. Whether to finance a survey for identifying function. | <ol style="list-style-type: none"> 1. Survey which adequately identifies function has or has not been performed. 2. Non-AID financing is or is not available. |
| 3. To approve or not to approve proceeding to attempt to formulate specific project. | <ol style="list-style-type: none"> 1. Performance of function appears or does not appear to be technically feasible. 2. Appears or does not appear to be prospect that project will be economically sound. |
| 4. Whether to finance work of project formulation. | <ol style="list-style-type: none"> 1. Non-AID financing is or is not available. |
| 5. To approve or not to approve proceeding with preparation of final design and specifications and plans for project implementation and operation. | <ol style="list-style-type: none"> 1. Preliminary engineering analysis indicates that project as defined is or is not technically sound. 2. Preliminary appraisal of costs and benefits indicates that a generally defined project is the best alternative for performance of that function. 3. That such a project is or is not likely to be within the technical capability (with such help as may be provided) and the financial ability of the borrower. 4. That a firm estimate of benefits comparable with an order of magnitude maximum cost estimate indicates that such a project is or is not likely to be economically justified. |

Table 1 (cont'd)

| <u>Decision</u> | <u>Findings Required</u> |
|---|---|
| 5. (continued) | 5. There is or is not a reasonably firm estimate of the cost of final design of the project. 6. That an adequate plan exists of design and planning work to be done in the final design and appraisal stage. |
| 6. Whether to finance such final design and implementation planning work. | 1. That non-AID financing is or is not available. |
| 7. To approve or not approve proceeding with project construction and implementation. | 1. There is or is not a reasonably firm estimate of the cost of construction and operations. 2. The relation between benefits and cost is that the project is or is not economically justified. 3. The project is or is not technically feasible and sound. 4. Adequate plans exist or do not exist for construction of the project. 5. Adequate plans exist or do not exist for operation of the project. 6. The project is or is not financially feasible. |
| 8. Whether to finance construction and implementation. | 1. Non-AID financing is or is not feasible. 2. There are reasonable prospects for repayment of the loan. |

Table 2

TIMING OF DECISIONS

| <u>Decision</u> | <u>T i m i n g</u> | |
|-----------------|---|---|
| | <u>M.O. Process</u> | <u>RAC Process</u> |
| 1 | Not specifically provided for, but probably fairly similar to alternative. | At beginning of "Identification of Function" stage. May be done as part of assistance strategy, country program, ad hoc individual country request or USAID recommendation. |
| 2 | Not specifically provided for, but probably fairly similar to alternative. | At beginning of Identification of Function stage. |
| 3 | Uncertain. Some time in the Preliminary Review stage at least by time of beginning of Feasibility Study. This may tend to merge into IR stage. | At end of Identification of Function stage. |
| 4 | " " " | " " " |
| 5 | Project implementation planning seems to begin early in Intensive Review stage but decision to proceed final design does not come until approval of proceeding with construction. | At end of Project Definition and Preliminary Appraisal stage. |
| 6 | Some project implementation planning and extensive design work is financed in the IR stage but decision to finance final design is made at the same time as the decision to finance construction. | " " " |
| 7 | At end of the IR stage but before final design is completed. | At the end of the Final Design and Appraisal stage. |
| 8 | " " " | " " " |

As described in Chapter 1, the sequence is usually initiated in one of two ways. In the first instance, the request for assistance for a road project between A and B may evolve from a continuous dialogue between the missions staff and host government officials. If this is the case, the project most likely has been assessed against the requirements generated by comprehensive planning, or sector studies. In the second instance, the initiation of the assistance process may begin with an informal request from the host country with or without prior consultation with AID, but it is a request based upon little economic information and analysis and does not result from a sophisticated approach to sector planning for establishing project priorities.

Phase I - Identification of Activities Possibilities

The first step is to make a qualitative judgment that the economic function (e.g., increase transport availability between A and B) is, or might be, economically beneficial and technically feasible and within the host country's capability to bring into being. It should be the work of the mission engineer and economist (working with host country engineers and economists) to rule out those projects that have a low probability of success (in the first instance discussed this would have been done during the continuous dialogue between the mission and host country personnel; in the second instance more work would be required). If it appears that success is unlikely, the project is dropped at this point; if success is certain or likely, proceed to the next phase.

Based on judgment and/or "back of the envelope" analysis that the economic function (increase transport availability between A and B)

appears to be economically worthwhile and technically feasible, the next step (preliminary appraisal) is to determine the alternative methods for implementing the function and to then select the most economically promising project.

Phase II - Project Definition and Preliminary Appraisal

By reviewing the economy (which may or may not be a continuous undertaking) and using the information contained in the Country, Regional, or other Development Plans, an analysis should be made to ascertain the extent to which the proposed function contributes to the development of the country. In cases where little detailed documentation exists, it will be necessary to establish the alternative methods for implementing the broader stated functions, for example, the function may be to increase transport availability between A and B. One method for accomplishing part of this function may be to provide a means for moving X tons of goods and Y people/month between points A and B by time t. Once this hierarchy of objectives has been established, it is possible to consider the alternative projects for satisfying the function.

The three alternative projects available for satisfying the function may be:

- (1) A road between A and B (the original request).
- (2) A rail system between A and B.
- (3) A water transportation system using the existing river from A to B.

Having determined the most likely alternatives (a fourth alternative of providing an air link between A and B has already been discarded

because of both the lack of trained personnel with air transportation skills and the high cost of the project) now proceed to:

(1) Identify any unusual technical, economic, managerial, and/or financial problems likely to be encountered in any of the alternatives.

(2) Provide order-of-magnitude cost estimates, based on standards, rules of thumb, past experience with similar projects, etc., for each of the alternatives.

(3) Provide estimates of the benefits anticipated from each.

(4) Determine the most economically sound, financially, and technically feasible alternative project.

Phase III - Project Design and Final Appraisal

Once the best project has been selected, its economic benefits established, an order of magnitude cost estimate arrived at, and a finding made that costs are likely to be within the limit of benefits, the next phase is one of detailed design and final engineering of the project,* preparation of the specifications, and development of a specific plan for implementation.

Final costs must be determined and benefits confirmed by the completion of this phase because at that time the Section 611 determination of a reasonably firm cost estimate and of economic and technical feasibility must be made.

Figure 4 illustrates the functions, alternatives, etc., for the four project sectors considered in this study.

* At this point another type of alternative, the design alternative, must be considered. Assuming that the proposed rail system was selected in Phase II as the most promising alternative project, the design alternative may be one vs two tracks and/or tunnel vs trestle.

ECONOMIC FUNCTIONS AND ALTERNATIVES
FOR FOUR PROJECT SECTORS

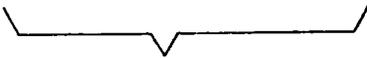
| <u>Sector</u> | <u>Economic Function</u> | <u>Alternative Methods for Achieving Economic Functions</u> | <u>Project Alternatives</u> | <u>Design Alternatives</u> |
|---|---|---|--|---|
| Power | Increase power production in Region X | Provide 600 KVA power to Area A of Region X in time t | Hydro <u>vs</u> Thermal Systems | 2-300 KVA Generators <u>vs</u> 3-200 KVA Generators |
| Agriculture | Increase agriculture productivity | Increase agricultural exports (or decrease imports) by X value in time t | Cotton <u>vs</u> rubber <u>vs</u> cocoa <u>vs</u> grain | Locational alternatives for cotton development |
| Transportation | Increase transport availability between A and B | Move X tons of goods and Y people/month between points A & B by time t | Road <u>vs</u> air <u>vs</u> rail <u>vs</u> water link between A & B | Tunnel <u>vs</u> trestle <u>vs</u> contour |
| Irrigation | Increase availability of irrigation water in Region X | Provide X tons of water in time t | Deep well <u>vs</u> river dam <u>vs</u> surface water collectors | 2 earth dams <u>vs</u> concrete dam |
|  Identification of Activities Possibilities | |  Project Definition and Preliminary Analysis | |  Project Design and Final Appraisal |

Figure 4

Chapter 3

PROPOSED INTRODUCTION FOR PROJECT APPRAISAL MANUAL

The adoption of the Alternative Process will require a replacement for the existing Feasibility Study Manual (M.O. 1221.2). This section presents the proposed introduction to this replacement and relates the project appraisal steps to the overall alternative process.

The purpose of this introduction is to provide a general explanation of the project appraisal procedure (Phases II and III of the new process) and to relate this procedure to the overall capital project decision-making process for AID capital project assistance. This explanation is intended to provide general guidelines for host country officials, consultants, contractors, AID loan officers, engineers, and others involved in capital project funding activities.

A. RELATION OF PROJECT APPRAISAL STUDIES TO AID CAPITAL PROJECT ASSISTANCE PROCESS

The AID capital project assistance process (see Figure 1, repeated here for the reader's convenience) is a five stage process including: (1) identification of host country economic activity or function possibilities; (2) project definition and preliminary appraisal; (3) project design and final appraisal; (4) project implementation; and (5) project evaluation. The two phase project appraisal procedure coincides with stages two and three of this process. Therefore, it is important to recognize that before the initial stage of project appraisal is begun, certain investigations (a prior stage in the capital assistance process) of the economy, or the sector have been completed which identify

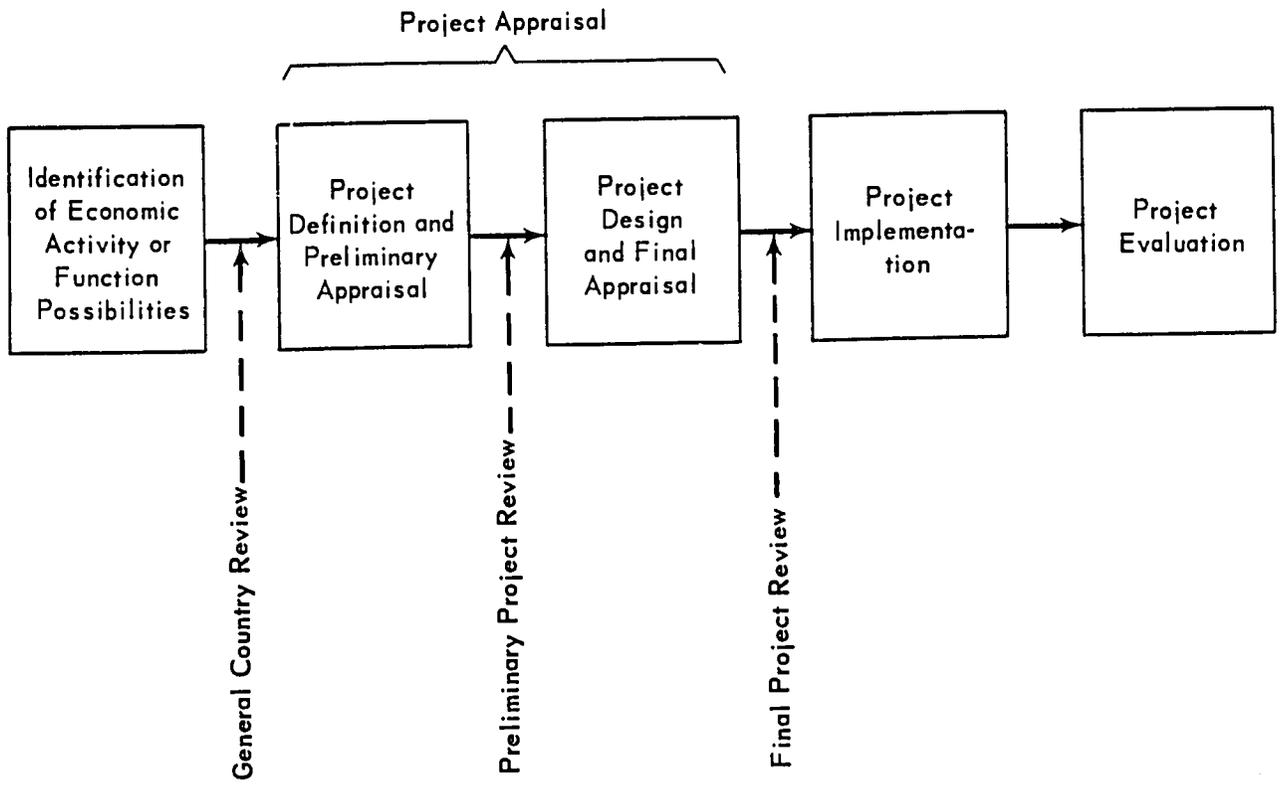


FIG. 1—A.I.D. CAPITAL PROJECT LENDING PROCESS

economic functions essential to the growth of the economy, (see Figure 2, repeated here for the reader's convenience). Such documentation as a National Development Plan, Regional Development Plans, Country Sector Studies, Country Assistance Plan, Long Range Assistance Strategy or even plans developed by (or for) other possible donors (World Bank, Inter-American Development Bank, etc.) may provide this data. In the event that none of the above documentation is available, it appears that, as a minimum, the following types of information should be considered prior to selecting projects for further consideration:

(1) Nature of the economy and its resources and where its comparative advantages seem to lie.

(2) Basic macro-economic data such as:

- (a) GNP
- (b) Distribution of income
- (c) Balance of payments and trade statistics
- (d) Country's debt servicing requirements.

(3) General demand and supply situation with respect to any products to be involved in projects for performing the identified functions.

(4) General information as to the size of activity operations required for economical operation.

(5) Information concerning any special situations likely to raise serious technical problems.

Consequently, project appraisal, which deals with the analysis of specific projects to determine their worthiness for implementation, is only a part of the entire AID capital assistance process; although this appraisal is of primary importance to the goals of the process.

This introduction will outline the general approach to be used in appraising projects. More specific details of such an appraisal can be found in the description of the capital assistance process (see M.O. __) and the following chapters of this manual, which describe the content of project appraisals for each economic sector.

B. PROJECT APPRAISAL STUDIES: A TWO STAGE APPROACH

Project appraisal studies should provide an efficient method for identifying the technically feasible projects that offer the highest economic returns to the host country, and for choosing those projects for funding assistance which are also financially and managerially sound. An efficient appraisal method would minimize time and resources (costs to the economy) used in project analysis, while assuring the selection of projects that would maximize the economic growth of the economy.

The procedure for appraisal of capital projects consists essentially of two stages. The first involves the selection of a specific project for the performance of an identified function and the determination of whether its benefits are greater than an order of magnitude estimate of maximum cost. The second involves final planning, design, and engineering establishing a reasonably firm estimate of cost and the making of the formal findings required prior to financing construction. The two stages, referred to herein as "preliminary appraisal" and "final appraisal," differ in terms of the relative emphasis on economic and engineering considerations, the nature of the findings required, types of specialists required to perform the work, and the type and detail of data required.

While all projects should go through a two stage analytical and review process this does not imply that AID must finance studies or activity in each phase. It is quite possible that AID may become involved in a project at a point where the necessary studies have already been made.

1. Preliminary Appraisal

The first task in a preliminary appraisal is to identify the broad alternative methods of accomplishing the economic function that is being investigated. Alternative project proposals, or a particular project proposal, may arise from a more general economic planning process, or they may have been developed on an ad hoc basis. In any event, if the broad project alternatives for performing the basic economic function(s) have not been appraised before the project is submitted for AID financing, this must be done in the preliminary appraisal study.

The next task is the selection of the best project for the performance of the function. This involves the evaluation or estimation of the costs and benefits of the alternatives. This task requires only estimates of benefits and costs rather than detailed and in-depth analysis to arrive at firm figures. Detailed estimates of cost and of technical feasibility involving expensive and time consuming engineering design particularly should be avoided.

Cost and benefit estimates will depend on the values assigned to certain parameters, such as product prices or wages. The desirability of project alternatives will thus be sensitive to variations in these parameters. The next principal task in a preliminary appraisal study is

therefore to identify crucial parameters to which project costs and benefits are most sensitive.

If the crucial parameters are inherently unstable (and not just unknown), sensitivity analysis will be useful in identifying the real uncertainty attached to each of the project alternatives. Sensitivity analysis will array the potential range of benefits and costs for alternative projects using a variety of assumptions, and because uncertainty is accounted for, this may be a major consideration in the selection of project alternatives.

After costs and benefits of alternatives have been estimated, the project which is the most promising to the host country economy should be selected for further more detailed analysis (provided, of course, there is a project which appears likely to be of sufficient benefit to justify further consideration).

The next task then becomes that of determining whether the project selected is of sufficient merit to justify an investment in its detailed planning and final design and engineering. This requires the establishment of the limit of cost within which the project would be economically justified, and identification of any significant legal, institutional, organizational, or financial difficulties which must be overcome. In this task primary emphasis is thus on establishing as specifically and definitely as is possible the nature and amount of benefits to be obtained from the project. Economic data and analysis is thus of primary importance. Engineering inputs on the other hand are to be limited to those necessary to identify any significant technical problems and to arriving at an

order of magnitude maximum cost estimate. The extent of engineering required for this purpose will, of course, vary from project to project. For example, a hydroelectric power project involving a large firm is likely to involve more detailed site investigation than would a thermal plant.

A further task is that of identifying any legal, organizational, management, or institutional problems which must be solved or questions which must be addressed before construction of the project should be undertaken.

The final task is that of developing a specific plan for undertaking final design and engineering and for project implementation planning, including dealing with legal, management, and institutional problems and with construction. An estimate of costs of the final design and appraisal stage must also be included.

2. Final Appraisal

This stage of the process involves the making of final statutory and other required findings as to economic and technical feasibility of the projects and the finalizing of implementation plans. The tasks to be undertaken include:

(1) Review of final design and specifications for technical soundness and adequacy, appropriateness to the local environment and situation, and economy in construction and efficiency in operation.

(2) In some cases in which final design and specifications do not provide a basis for a reasonably firm estimate of cost, review of bid documents and bids received.

(3) Making a reasonably firm estimate of cost.

(4) Review of final plans for management, for dealing with organization and legal questions, and for construction.

(5) Final review, in the light of any changed circumstances, of benefit calculations made in the previous stage.

(6) Comparison of costs and benefits and the making of the necessary formal findings of economic feasibility.

(7) Preparation of necessary implementation documents, such as the loan agreement, letters of implementation, and the like.

3. Project Implementation and Project Evaluation

The Project Implementation and Project Evaluation stages follow the completion of the project appraisal stage. In the Project Implementation stage, the bid documents are prepared (although this will sometimes, out of necessity, be performed in the Project Design and Final Appraisal stage), the bids are received and evaluated, the construction contract is awarded, and the construction is undertaken. In the Project Evaluation stage, the project is analyzed and evaluated to assist AID in measuring the degree of success achieved in capital loan assistance activities and in devising methods for improving project selection and the process of capital lending.

4. Summary

In summary, capital project appraisal is portrayed as consisting of two stages: (1) a stage that emphasizes economic analysis for identifying the promising project alternative for accomplishing specific

economic functions in which order of magnitude cost estimates are made, and in which possible legal, organizational, and operating problems are identified; and (2) a stage in which the project is designed and firm estimates of costs made, plans for implementation are prepared, and final decision as to construction financing is made. Such a procedure should minimize expenditures on project examination, particularly expenditures early in the capital projects decision-making process, while providing a means for choosing the most economically sensible projects for financing.

Chapter 4

COMMENTS ON AID-PREPARED DRAFTS OF ELECTRIC POWER AND WATER AND SANITATION CHAPTERS FOR PROJECT APPRAISAL MANUAL

INTRODUCTION

This chapter presents RAC comments on the AID-prepared draft of the Electric Power and Water and Sanitation chapters for the Preliminary Appraisal Manual. RAC's task was to review these documents for their conformance to the alternative process.

ELECTRIC POWER

The following major deficiencies have been identified in the Electric Power chapter developed for incorporation into a manual(s) covering the alternative process for analyzing and making decisions with respect to financing capital projects:

(1) It is not related to the new process. Instead of being related to the 5-phase process being developed, it discusses only a $1\frac{1}{2}$ -phase process; namely, "preliminary appraisal" and "feasibility study." "Project definition and preliminary analysis" is one of the five phases of the new process, but there is no "feasibility study" stage. The paper seems much more related to the past process than to the new approach. It makes no reference to the "identification of possible activities" stage, covers only a portion of "project design and final appraisal," and does not take account of the "project implementation" and "project evaluation" stages.

(2) Even if the two stages set up in the draft chapter are accepted, the distinction between them and the differences in the

decisions are to be made, the analysis required, and the information to be obtained are not clearly set forth as required for an instructional manual. For example, although by and large the preliminary appraisal phase seems to be concerned with economic and financial matters and the feasibility study stage is concerned primarily with engineering matters, engineering matters are dealt with in the former, and economic and costing matters are dealt with in the latter. The degree to which each is to be dealt with in each phase is not indicated, however, and the distinction between the two phases is blurred.

(3) The material is not presented so that it is operationally relevant. An indication of general principles (see p.7) is not enough. An instructional document must say who does what, when, and why, and sometimes how. The verbs "evaluate," "study," "review," and the like, which are used so frequently, standing alone do not convey any useful guidance to the users of the chapter. Further, the material does not indicate precisely what decisions and findings are involved, at what points, and what data and analysis are necessary to reach or support them. In many instances the instructions are given in the form of questions rather than in the form of providing guidance.

(4) There is insufficient distinction by type of project as to the data and analyses required. For example, much of the demand and generation data and analysis set up as a general requirement may not be required on a project for distribution lines from an existing generating plant to an existing market.

(5) Some of the economic reasoning appears to be either faulty or not properly related to the applicable decisions (see discussion of pp. 25 to 28 and pp. 30 to 40). Further, the use of shadow prices and shadow exchange rates is at least open to question and, if to be used, should be subject to specific guidance as to the circumstances in which they are to be used and on how they are to be applied. No such guidelines are given. The discussion of allocation of costs in multipurpose projects also appears to be deficient.

(6) Most of the material in pp. 40 to 56 has been taken from the old "gray book" (M.O. 1221.2, "Feasibility Studies, Economics and Technical Soundness Analysis, Capital Projects," 1 October 1964). This material has not been shaped to provide improved guidelines for project selection or to redirect the analysis so as to be consistent with the recommended capital lending process. This portion of the paper appears to assume that a "preliminary appraisal" has never taken place and does not recognize that the procedures set forth belong in the preliminary appraisal phase of the analysis.

(7) To be useful in addition to providing guidance for the consultants, A&E's, and AID personnel, the manual in which this chapter is to be included must identify what type of analysis is required in each step, what it is to be used for, and when it is to be completed. This chapter does not accomplish that purpose.

A page-by-page review of the draft document on Electric Power follows. Comments are made on the individual section or item and are the basis for the major and more general points just described. The numbers shown first are page numbers of the draft.

2, last para. The process stages listed are different from those in the proposed alternative process. Further, while the purpose of the chapter apparently was not to discuss all phases, four phases are listed and only two are discussed, but no indication is given as to how those two are related to the other two. Something is wrong with the last sentence of the paragraph. Obviously, it is not anticipated that at the completion of any step in the process the decision will necessarily be that AID funds are not to be used.

3, first full para. It is not helpful to say that "Preliminary Appraisal is 'system planning'." That depends on what system planning is. It may be Phase 1 of the recommended process or even less. The last sentence thus may not be true and the second sentence is question-begging since no criteria as to what constitutes "adequate and competent long range system planning studies" are given.

3, next para. This paragraph is obiter dicta, which may or may not be true.

4, Point doesn't come through. If the system addition is "appropriate" what is wrong with a "very short economic life"?

4, Conclusion seems to be a non sequitur. Most major projects of whatever sort are a part of some kind of "existing system." For example, this is certainly true of most transportation projects.

5, What are "pre-investment surveys" and what is their relation to the capital projects process being dealt with?

5, next para. Argumentative and unnecessary to the paper.

6, first para. Sets up a two-stage process of analysis rather than the five-stage process in the suggested process or the four-stage process set forth on 2 of the draft chapter. If only a part of the total process is being dealt with what part should be indicated?

6, second para. Is quite confused in trying to distinguish between the preliminary appraisal and feasibility study stages. It seems that costs, benefits, and engineering considerations are involved in both stages but that more is to be included in the feasibility study than in the preliminary appraisal stage. There is, however, no indication of how far the analysis is to be carried in either stage. There is no indication of what decisions are required in each stage or of where a project stands at the completion of either or both phases.

7, Stages. "In this chapter, emphasis will be placed on the central issues and objectives of each stage of analysis; each analyst and reviewer must assume the responsibility for applying the general principles in his specific case." Although some judgment and discretion must be applied in each case, it is not adequate to leave an analyst and reviewer with only general principles. They are sure to be applied differently by different people. There must be specificity in terms of decisions to be made and data and analysis required. (See general comment 3)

Pages 8-37, Pt. 2.

General. This discussion seems to telescope Phase 1 and the first part of Phase 2 of the suggested capital process in such a way as to make it almost impossible to disentangle the discussion. The first

sentence, p.8, states, "The immediate purpose of the Preliminary Appraisal is to provide a documented basis for a decision whether to proceed with the formulation of a specific project or expansion program in electric power systems (sic) and specifically whether to undertake the next study phase, the Feasibility Study." Actually, the decision as to whether to formulate a specific project should come at the end of the first phase of the suggested new process. Given an affirmative decision, the next stage should be the formulation of the specific project in such detail as required to permit a decision as to whether to proceed to the next stage, i.e., detailed project design and planning. Failure to so distinguish the stages of the process leads to confusion in statement of purpose, information requirements, analysis required, and decisions to be made. It gives rise to the establishment of the so-called "feasibility study" stage, which should have no part in the process.

8, para. 2. In the light of the first paragraph, "the decision to proceed" is, as indicated, a decision to proceed with the formulation of a project. However, the elements indicated in items (1)-(8) as being required to be considered in such a decision seem to be elements required to formulate a project rather than elements required to reach a decision to formulate.

9, b. Scope. The evaluation listed here, in contrast with the listing which precedes it, seems to be related to a decision as to whether to formulate a project. The different considerations are mixed between the discussion of "purpose" on pp. 8 and 9, and the discussion of "scope" on pp. 9 and 10.

10, second para. Listing items with no suggestion of how they enter into the analysis is not helpful. Further, some of them appear to be appropriate for one phase of the process and others appear to be suitable for other phases. For example, surely consideration of questions of operation, management, and training occurs at a different stage from consideration of availability of power, value of service, and effect of country economies on usage of power.

10, last two paras. Either these should be related to power, or they should appear in general chapter.

11, first para. How is one to know what "system planning" consists of and thus how is the user helped? Without knowing, it is suspected that it contains more than is required. Also what are the criteria for determining what constitutes "a good up-to-date plan"? Finally, who is going to conduct the Preliminary Appraisal and how can arrangements for conducting it "promote system planning on a continuing basis"?

11, second para. The data and projections stated to be presupposed in the Preliminary Appraisal generally seem to be legitimate requirements for formulation of a project. Why then are they "presupposed" rather than being integrated into the process? Finally, if they are prerequisites, how can they be "undertaken concurrently, preferably as a part of the Preliminary Appraisal"? Also, what is the alternative implied by the word "preferably"?

12, a.1. Doesn't seem to be different from what is stated in the last paragraph, p.37, as being the first of two questions that must

be answered in the "feasibility study" stage. Thus, the confusion between stages appears again.

12-15, II, Summary Outline. This seems to be a listing of tasks to be performed in the Preliminary Appraisal stage. However, these tasks do not seem to be specifically discussed elsewhere in the paper. Standing by themselves they are not adequate as guidance to users. They repeatedly state that the task is to "identify and evaluate" something. However, no criteria or standards of evaluation are given and one is not told what the evaluation is for. Many of the instructions are question-begging, e.g., phrases such as "economic or analysis that may affect electric power utilization or development", "applicable electric power experience", "noneconomic, nontechnical considerations pertinent to proceeding with the project", "principal financial considerations pertinent to project evaluation", etc. are used without guidance as to what may be "applicable" or "pertinent", and so forth.

13, c.1. Says that costs are to be quantified without indication of to what degree of accuracy. Also, it is not clear that all the cost elements mentioned, e.g., replacement and depreciation, are necessary at this stage of the process.

14, 8. Not clear as to why it is necessary to determine the extent of design engineering required to develop definitive cost estimates. If the next stage is to include final design, this step seems unnecessary as final design will be complete. If it isn't to include it, this draft chapter misses the point that under the alternative process design will be completed before definitive cost estimates are made.

14, d.1. The purpose of establishing "shadow" exchange rates and interest rates and under what circumstances and how it is done need to be specified somewhere.

14, e.2. para. 3. Cash flow analyses are not necessary to a preliminary appraisal or project definition phase.

15, III.A. General, 1. Guides as to the degree to which investigation should be pursued at each stage are essential if the process is to have any meaning. This is critical to a logical and efficient staging of the analysis.

15, 2. Same point. Also, the project definition and preliminary appraisal stage in the suggested process are supposed to carry the analysis to the stage of defining a specific project; thus, the analysis of alternatives cannot be left to some later stage.

16, Note. The material here typifies the confusion among stages and the lack of precision as to how far the analysis progresses in each stage which runs throughout the chapter.

17-19. The material is more appropriate to a general chapter than to a chapter on power.

17, para. 2. The reason for the distinction in the first paragraph is not clear. The physical life of the project can't be shorter than the economic life, hence, why not be concerned only with the economic life?

18, para. 1. What are "proven and accepted methods of estimation"? Some guidance is needed.

20, c. All electric power projects are not necessarily long lead time and large scale. Thus there may be a need for distinguishing by type of project in the discussion that follows; e.g., it may not be necessary to make 20-year forecasts for all types of projects.

23, d., para. 1. Again the question is begged. The refinement of an estimate should be determined by the analytic role the estimate will play and effort should not be expended for detail not relevant for decision making. The questions are, "What is the analytic role to be played, what refinement is necessary to that role, what decision is being made, and what detail is necessary to support it"?

23, para. 2. Same point. One must know the degree of detail and precision to which estimates must be carried in each stage if the stages are to have any meaning.

24, para. 1. What are the revenues to be net of? If, as a measure of benefits, they are to be compared with costs, why should they be net?

24, para. 2. Revenues are a function of consumption and rates, but how does one arrive at "an assumed level and structure of electricity rates"?

24, para. 3. Is such an argument for the use of revenues as an indicator of benefits necessary? Most people would probably be more prepared to accept the fact than the argument.

24, Non-Revenue Benefits. Much of the discussion beginning here and continuing to the middle of p.27, to the extent that it is valid, seems more suitable for a general chapter than for a chapter on power.

25, para. beginning as last line on p.24. This discussion seems to overlook the possibility of diminishing margin utility. There is some question as to its economic soundness.

25, last para. How does the cost of a more costly alternative constitute a benefit in addition to the revenues to be derived from a less costly alternative?

26, para. 1. It appears that the benefits resulting from electricity used in production which would not take place without electrification are already taken into account in the revenue estimate. What does cost of higher cost alternatives have to do with the question?

26, last para. Is the point that power rates and taxes are too low? The validity and practicality of assigning benefit values to "the private amenities associated with electrified dwellings" or to the "social values of street lighting" is highly questionable. It would seem that such benefits should be considered only if a project is on the margin of acceptability and some slight additional benefits would be critical in making it acceptable.

27, para. 1. Same point. If costs significantly "exceed estimated tangible benefits" it appears that AID would be ill-advised to finance a project on the basis of some precarious evaluations of intangible benefits.

27, Costs of an Alternative as a Measure of Benefits through p.28. The point of this section is difficult to grasp. Opportunity costs are, of course, the true economic cost of an undertaking, but it is a distortion of the concept to say that the benefit of one alternative

is what is saved by not doing something else. As the discussion indicates, this could make a strange kind of sense only if one thing is certain to be done if something else isn't. Even so, AID would not want to be in the position of having financed a project whose benefits consist of the savings resulting from not having done something even more foolish. If the benefits accruing to a project on its own merit are not sufficient to justify it, AID cannot afford to finance it.

30, para. 1, last sentence. The practicality of a pilot project in electric power for the purpose of testing the benefits of a new service is open to serious question. What kind and scale of project would be likely? Any such project would have to be set up under very carefully defined circumstances and conditions (none of which are touched on in the draft).

30, para. 2. Reasoning seems unsound. Possibly, although it isn't demonstrated, there may be more intangible benefits in a project for new service, but this doesn't mean that such benefits should be given "greater weight" than revenue benefits. Certainly the fact that unit costs are likely to be higher doesn't mean that greater weight should be given to any type of benefit.

31, para. 1. It is difficult to determine whether this argument is valid since the whole chapter does not make clear where one stage stops and the other begins. However, on the basis of the suggested Capital Projects Process the argument is not valid. Under that process the Project Definition and Preliminary Appraisal stage carries the project to the stage of decision as to whether to go to final design. It is

precisely in the stage of project definition that marginal cost analysis is appropriate. It would have no role to play in the project design phase. The last sentence is also puzzling. Why does the scale of transmission projects depend more on marginal costs than does the scale of a generation project? Is it because the investment may be in bigger chunks in a generation project?

31, para. 2. Are projects to be priced in local currency with foreign exchange costs covered or vice versa, or is the pricing method to vary depending on the proportions of the local currency and foreign exchange? Probably this question (as well as those in the whole paragraph and the next paragraph) should be covered in a general chapter.

32, Adjustment for Shadow Prices. There is considerable difference of opinion as to whether in practical situations analysis is improved or impaired by the use of shadow prices. In any event if they are to be used, the circumstances and the manner in which they are to be used should be very carefully prescribed. A general chapter would be a more appropriate place to handle such a discussion.

32, Induced Costs. This discussion is confusing. It is agreed that all the costs resulting from the whole system affected by the project should be included in total costs, but why should they be referred to as "social costs"? Also, the specific mention of shadow pricing tends to confuse the discussion. This is particularly true of the discussion of the example of the flooding of a valley in which "induced costs" and "shadow prices" are indicated as being alternatives. Shadow pricing is a method, not a cost. Finally, the last sentence suggests that something

more than an estimate of induced costs may be made in some phase subsequent to the Preliminary Appraisal, but it is not clear as to what phase or why.

33-34, Costs in Multi-Purpose Projects. This discussion is not specific enough to be operationally helpful and may be economically unsound. The first sentence states, "The basic estimates of the power costs in a multi-purpose project are the assigned costs separable and prorated in the project due to the inclusion of power". How are they to be separated and prorated from an economic point of view when there is no specific way of allocating joint and common costs to various purposes in a multi-purpose project? The only valid way of making the analysis then is to analyze separately the costs and benefits for each purpose in a multi-purpose project assuming all costs which would be required for a project for each purpose alone. (1) In the unlikely event that each subproject is justified on this basis, there is no question but that the total project should proceed. (2) If one or more but less than all subprojects are justified on that basis, possible subproject combinations can be analyzed with only the additional costs required to add other purposes (not justified standing alone) being assigned to that subproject along with appropriate marginal benefits. (3) If no single purpose is justified standing alone, each possible combination should be considered as though it were a single purpose and the analysis should then proceed again as in (1) and (2).

34, para. 3. It isn't helpful to say that "under certain circumstances it may be convenient to..." without specifying the circumstances. Also, it is implied that shadow interest rates will always be used.

34, para. 5. What are the stages of Preliminary Appraisal and what kind of benefit and cost comparisons are made at each stage? Why is an alternative dropped from consideration "if a minimum estimate of its costs exceeds a maximum estimate of the cost of any other alternatives"? May not its benefits also exceed the benefits for other alternatives?

35, Discussion is too general to be operationally helpful. If it is included, it is more appropriate for a general chapter.

36, Who gives whom a shadow interest rate? How is it arrived at and in what circumstances is it to be used?

37, A. Introduction. The entire project analysis, including the "Preliminary Appraisal" (PA), establishes the economic, financial, and technical soundness of a project. The Feasibility Study is not the only part of this analysis (p.37, para. 1). In fact, the term for this stage of the analysis, Feasibility Study, is in error and ought to be eliminated entirely from the discussion of capital projects.

37, para. 2. This confuses a process stage with some kind of a specifically identifiable study. A "Preliminary Appraisal" is a process stage not something comparable with a "sector study or a system planning process or other procedure acceptable to AID". Also, the question is not whether the procedure has been acceptable to AID but whether essential decisions supported by the necessary data and analysis have been made.

37, para. 3. The confusion between stages comes through again. By the time a preliminary appraisal is completed, the specific project should be well defined and alternatives eliminated from consideration.

37, para. 4. The question stated here seems to be more appropriate to the project identification and preliminary appraisal phase. For example, there appears to be no difference between the first question stated here and that set forth in II.A.1. on p.12.

38, para. 2. The paragraph is in basic conflict with the suggested alternative procedure. The PA should have isolated a single project alternative for design and final analysis. Although it is possible that various parts of a single project may be subjected to alternative design analysis, the PA should have designated the single preferred project type (e.g., hydroelectric, thermal, or distribution project or some combination) for final design and analysis. Major reasons for recommending improvements in the Capital Assistance Process are to diminish the amount of costly engineering design work associated in the past with the Capital Assistance Process, to diminish the time necessary to make decisions on capital loans, and to improve the economic data base on which these decisions should be made. The separation of the analysis into three stages as discussed in the subject paper (i.e., PA, FS, and final design) would mean serious time delays and increase costs; therefore, every effort should be made not to separate this analysis into three stages, thereby continuing with present AID capital lending procedures. This is an important issue, at the heart of which is the question of whether the present capital loan system can be molded and shaped into an improved form using the above criteria for measuring improvements. This paragraph and those immediately following typify the basic non-conformance of this draft chapter with the suggested alternative procedure. With this in

mind, it would appear that almost everything in the subject paper (Pt. 3) therefore, should be included in the PA. The subject paper only isolates a single project alternative, and "final design" is never discussed.

38, para. 3. It is not clear whether a final decision to finance the construction of the project is being made at the end of this stage. This paragraph suggests that such is the case. If this is so, this introduces all the current difficulties of making a final decision to finance construction before an estimate of cost based on final design is available and one of the major purposes of the alternative process is vitiated.

39, para. 1. A specific project should have been defined in the Preliminary Appraisal stage and alternatives eliminated in that stage — not in some subsequent stage in the process.

39, remainder of page. This material is equally applicable to the Preliminary Appraisal stage and probably should be included in a general chapter.

40, to end of chapter. This material seems to be a listing of specific actions and analyses required throughout the entire capital projects analysis process without distinction among the stages. As a result, it provides no guidance as to what is to be done when and for what purpose and confuses the question of what part of the process is being dealt with in this chapter.

40, Outline. This outline method of setting forth the analytical requirements has many limitations. Its basic difficulty, however, is that it includes actions which should have already been accomplished in the

preliminary appraisal, fails to indicate what analysis the material listed as being required is in support of, and carries the information requirements partially into what would be required in the final design stage.

40-44, Initial Action, b. Establish System Conditions.

Almost everything suggested here should have been done very easily in the process and certainly before a "feasibility study" as suggested in the draft is undertaken (e.g., identify scope of service areas, loads, and characteristics of system; identify system investment, operating problems, current planning activity, rate structure, etc.). In essence, it says, "collect all possible data related to the power system" without taking into consideration that much of this work properly belongs in a system inventory, done prior to a project study, or that much of what could be called analysis would have been already completed in a preliminary appraisal. The old "gray book" is repeated verbatim without an attempt to improve guidelines for project selection or to provide guidelines that follow or are consistent with the "new" recommended Capital Assistance Process.

44, 2. Power Requirements. How does this section improve the PA? Certainly power requirements (by class, etc.) were projected over a 20-year period by PA (pp. 1-36).

44-51, 3. Technical Soundness. The one (or several) word phrases in this section provide little in the way of guidelines to the engineer or whoever is performing the "Technical Soundness" study. What, for example, does the following mean, in what detail (after the meaning

is explained) is it to be performed, and is it done for each alternative or just the preferred alternative? (Following quoted from p.45):

"a. Engineering

1. Location-site conditions, transportation, availability, accessibility, cooling water, fuel, operating labor, electric system functions.
2. Design-functional components, reliability, efficiency, effectiveness, general layout..."

51-52, 4. Economic Soundness. This section confuses the timing of economic analysis, suggests that alternative projects are still under consideration. Many of the "components" and "choices" (Pt. 4, a., p.51) should have been eliminated in the PA (pp. 1-36), and more discussion is essential as to where whole project alternatives are compared. Certainly this should be at the earliest possible point in time—not after compiling complete technical data.

52-56, 5. Financial Soundness. These procedures often will have been performed in the earlier PA or elsewhere in the analysis. Again, the subject paper falls back on old procedures ("gray book" and "Memorandum of the President") without consideration for improving and streamlining these procedures for consistency with recommended improvements in the Capital Assistance Process.

The analysis shown in the last paragraph, 55, has shown as being performed at other points [p.51, Pt. 4.b., and the PA (pp. 1-36)]. There is also apparently an underlying premise that the "Financial Soundness" (four pages of discussion) is more important than "Economic Soundness" (one page of discussion). Such an assumption is not valid.

56, 6. Organization and Management. This is an important aspect of any project analysis, but criteria should be presented for assessing organizational and management requirements. Parts of this organizational and management analysis should have been performed earlier in the PA (pp. 1-46). Here, and in other sections, it is apparently presumed that little has been accomplished in a PA since this largely repeats activities to be accomplished in the PA. This requires full clarification and appears to be still a major area of confusion.

WATER AND SANITATION

This chapter has three major deficiencies:

(1) It fails to relate the analysis suggested to a decision process. This results in uncertainty as to exactly: (a) what decisions are required to be made at the stage of the process being discussed; (b) what findings are required to reach those decisions; and (c) what data are necessary to permit those findings to be made.

(2) It addresses itself only to the question of "project appraisal," overlooking the fact that under the process staging involved in the task is "project definition (or formulation) and preliminary appraisal." The questions involved in project definition are not treated.

(3) It is not specific enough in stating exactly what engineering, economic, financial, and institutional data are required at this stage of the project. For example, it does not answer such questions as, "Just what engineering data are required to permit a decision that from a technical point of view proceeding to final design is or is not justified?"

"What specific engineering data are required to permit a judgment that costs are likely to exceed or not to exceed the limits imposed by the benefits analysis?" "What economic analysis and data are required to permit the limit of cost within which the project would be justified?" "What financial analysis and data are required to support a finding that the project is likely to be financially viable?" "What details with respect to institutional, organizational, and project implementation arrangements are required before proceeding to final design and what can be left to the design stage?"

The organization of the paper could be improved. The statement of objectives and scope might better be given first rather than being inserted between Basic Data Required and Financial Analyses. It would also seem desirable not to separate a statement of basic data requirements from the types of analysis to which they pertain.

Detailed comments are given in the following list:

- 1, para. 1. Not helpful since it deals with whether data are available rather than with the question of what data are needed.
 - 1, b. What are "city or community development maps and plans"?
 - 1, d. Why is detail required on the existing water system, e.g., construction costs?
 - 2, f. It isn't clear why so much water data are required.
 - 2, h. Are unit costs needed at this stage? What is to be the basis of cost estimates?
3. Doubt that data on import regulations, duties, and charges; inland transportation facilities; and taxes are required at this stage.

3, i. In what detail is a financial and organizational plan needed at this stage?

3, j. National financial data probably should have been obtained in the previous stage before deciding to formulate a project.

4, A. Statement of objectives is incomplete. It relates only to project appraisal and overlooks the fact that the first objective is to identify a project.

4, B. Technical. Although the development of individual projects in the context of a long-range master scheme is much to be desired, it may be a bit idealistic to expect it to be possible in all cases. What is critical is that the current project not preclude appropriate future alternatives. Perhaps all that is absolutely essential is some kind of planning such as mentioned under "Urban Development Planning" on p.5. It would not appear essential that there be a time-phased scheme for implementation of a total program.

This discussion also gives no guidance as to what the technical content of either a time-phased program or the plan for an individual project should be.

5, 3. Engineering. This section likewise fails to provide specific guidance as to what engineering information is required to define the project for the purpose of preliminary appraisal.

6, 4. Alternative Systems. Are combined storm and sanitary systems and separate systems the only alternatives that may require consideration? What about systems involving treatment vs those not including

treatment, for example? Also are there only economic considerations which bear on a choice? Don't engineering and other considerations bear on the question?

6, III. Financial Analyses. Whether financial viability, as stated, is the most important evaluation to be made in a preliminary evaluation may be subject to argument. In any event, however, the question is not what evaluation is most important, but what is necessary and what data are necessary to make it.

It is not clear why it is necessary to develop cost estimates for an entire system in all cases. If the particular project is economically and financially viable, total system cost may be beside the point. Also guidance is needed as to what engineering cost estimates consist of either for a system or a project.

8, IV. Economic Analysis. First paragraph doesn't give much operational guidance. It doesn't help much to say that a sewage system must be considered in the category of social overhead and justified in the same way as other social services unless somewhere the question of "how social overhead projects are to be analyzed" is dealt with. Similarly, to say that the question is whether a municipality can afford a sewage system isn't very helpful. Almost any project considered alone can be "afforded." Some guidance is needed as to what factors need to be considered in reaching a judgment. Similarly, the discussion is unspecific as to what factors should be considered in reaching a conclusion as to whether the country should "incur a foreign debt to finance the project"? In what way are sewerage projects different from others in this respect?

9. It may not be possible to quantify with accuracy the kind of benefits listed, but it would seem that at least an analysis should be made to ascertain whether such benefits are present.

10. A simple listing of Financial Analyses, Manpower Study, and Legislative Study as being required is inadequate for operational guidance. The content of such analyses and studies needs to be specified.