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REPORT ON CONSULTANCY
FOR ECONOMIC EVALUATION
OF LOW-COST SANITATION PROJECT
IN GUAYAQUIL, ECUADOR
(SUPPORTED BY IDRC)

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Guayaquil, Ecuador

SUMMARY

This is the report of a consultancy by a North American economist sent by IDRC at the request of EMAG to assist the research staff in Guayaquil on their project concerning low-cost sanitation alternatives. It is limited to "economic evaluation", but that term is interpreted fairly broadly, consistent with the stated aims of the EMAG group.

The report consists of the following parts: (I) introduction; (II) survey of "economic evaluation" of health projects; (III) clarification of the report's structure and outline; and four additional parts (IV-VII) on economic analyses, covering effects, estimation of costs, interpretation of costs, and financing.

In each of those four parts, the consultant defines or explains the nature of the analysis involved, describes and appraises the plans and efforts of EMAG's permanent staff members and its contracted local economist for work related to the analysis, and recommends specific studies to be conducted in order to complete the economic evaluation of the project by the time of its termination. The part on cost estimation is the longest.

Because the project is scheduled to end relatively soon (in six months) and because all the principal participants, as well as the consultant, are concerned over the large amount of work recommended to be completed within the short period, some administrative and related suggestions are offered in an appendix.

It is not possible (or necessary, it appears) to summarize the recommendations of the report here. Readers are referred for those to section "D" of each of the last four substantive parts (IV-VII). If a study is not recommended, it usually is simply omitted without discussion.

I. INTRODUCTION

A. General Nature of Consultancy

1. Visit to Guayaquil by external consultant (Dr. Robert L. Robertson of the U.S.A.) in order to advise and assist study [investigacion] team of Empresa Municipal de Alcantarillado de Guayaquil ("EMAG") in appraising past activities and planning the rest of them for the economic evaluation of its project.
2. Production of a tentative written report (in semi-outline form), discussion of it with EMAG researchers, and revision to create this final report.

B. Specific Nature of Consultancy

1. Activities during visit and afterward:
 - a. Meetings with EMAG staff and its local economist
 - b. Review of all available reports and data
 - c. Visits to sites of project's construction
 - d. Drafting of tentative written report (in English)
 - e. Discussion of report with EMAG staff and local economist
 - f. Revision of report (in English) -- Final version in handwriting left with EMAG in Ecuador; typed copy will be mailed to Ecuador.

2. Scope of work:

- a. Components and topics are stated in consultant's "terms of reference", transmitted to him from EMAG via IDRC.
- b. Meaning of "economic" is interpreted broadly, but consultant is not responsible for evaluation of social or technical aspects of project.

C. Some Matters of General Perspective of Consultancy

1. History

- a. Visit of this consultant follows much work by EMAG staff and its local economist (Econ. B. Toro) over several years; it follows also a visit in March, 1982 of another external consultant (Dr. A. Solari).
- b. A relatively short period remains before the formal termination of the project (in September, 1984); that must affect this report.
- c. The small and non-representative samples of several types of program alternatives (types 1, 2, and 3) that have resulted in practice will limit, to an unknown extent, the validity and applicability of the project's results; it now is too late to do anything about that, and perhaps this constraint was inevitable in a "real world project".

2. Personal interactions -- Visiting economist has worked very closely with EMAG, especially Ing. V. Roura and Ing. J. Zambrano, and the local economist, and has received full cooperation from them.

D. Outline in Brief of Remainder of Report

Part II: Survey of "Economic Evaluation" of Health Projects
(especially for Sanitation)

Part III: Organization of Coverage in Report for Each of the Selected
Kinds of Economic Analyses

Part IV: Effects - "Benefits"

Part V: Costs -- Estimated

Part VI: Costs -- Interpreted (including Costs in Relation to
Effects, if appropriate)

Part VII: Financing -- Community Contributions and Other Issues

Appendix: Additional Comments of Consultant Concerning Certain
Matters of Project Administration and Timing

II. SURVEY OF "ECONOMIC EVALUATION" OF HEALTH PROJECTS (especially for Sanitation)

- A. Project has strength (merits) of integrating social, technical, and economic aspects, but only the "economic" ones are covered here.
- B. The Possible Range (Breadth) of "Economic Evaluation"
1. Potentially it can be very broad, including issues [temas] in many parts of the field -- for example, ones concerning Demand [demanda], Supply [oferta], Relationship between inputs and outputs, and Finances, including budgets.*
 2. "Economic evaluation" also can be either highly theoretical or empirical and practical. Clearly, the EMAG project, located in the "real world" and seeking policy guidance, should be empirical in its final phases after its earlier emphasis on methodology and certain theoretical concepts.

*See report of IDRC seminar: CIID, Informe del Seminario sobre Aspectos Economicos en la Prestacion de Servicios de Salud, (Bogota, Colombia, Noviembre 1980).

3. Recommendations of this report are selective, based on the consultant's estimation of the practical analyses that can be accomplished in the time that remains for the project and related to work already begun by the study team.

4. On the whole, the recommendations are consistent with the original proposal to IDRC (Propuesta, pp. 32-33), except for its suggestion of analyses from two points of view and except for its oversimplification (implied) in studying the conventional sewage treatment program, and are consistent also with most of the suggestions of Dr. Solari and the responses of EMAG and Econ. Toro; for the principal point of difference between Dr. Solari and the group, this consultant (Dr. Robertson) agrees with the EMAG position that an attempt to estimate the health status impact of the new sanitation programs would be unwise.

C. Economic Analyses Selected (Recommended)

1. Preliminary comments

- a. These presuppose careful identification or definition of every program alternative, such as the types "1", "2" and "3" units.

- b. They are consistent with the priorities of the EMAG team that were stated to the consultant.

c. Each of these "analyses" includes several potential studies.

2. Kinds of analyses:

a. Effects - "Benefits"

b. Costs -- Estimated and Interpreted

c. Financing

3. Omission of a study implies that it is not recommended.

III. ORGANIZATION OF COVERAGE IN REPORT FOR EACH OF THE SELECTED KINDS OF
ECONOMIC ANALYSES

Each kind of analysis is covered in a separate part below, each part is organized as follows:

- A. Nature of Analysis

- B. Work by EMAG Investigators (and Associated Consultants and Contractors) to Prepare for Accomplishment the Analysis
 - 1. Past through present -- Work already done
 - 2. Future -- Work planned

- C. Appraisal by Consultant of Past-Present and Future (Planned) Work of EMAG

- D. Recommendations by Consultant of Studies to be Conducted for Each Analysis during EMAG Project (and some mention of additional possible ones for later)

IV. EFFECTS - "BENEFITS"

A. Nature of the Analysis

1. "Effects" of a health program are not necessarily an economic aspect of it, but it is necessary to estimate some important effects in order to conduct certain economic studies -- for example, cost-effectiveness analysis ("CEA") [análisis de costo-efectividad], which is covered further below.
2. Effects can refer to medical results (e.g., improvements in health status), social-psychological impact (e.g., satisfaction), or many other things; it is not yet clear to the consultant which effects are of greatest interest to the EMAG study team, which plans to identify them soon.
3. "Effects" or "Benefits"
 - a. Some persons prefer to use the word "benefits" instead of referring to "effects" that are positive.
 - b. However, a problem in that usage is that it might seem to suggest cost-benefit analysis [análisis de costo-beneficio], which is not practical in the health field, including sanitation, due to the difficulty of placing a monetary value on most effects; that difficulty occurs because many health services, especially public ones, lack market transactions and

because many effects (or benefits), such as freedom from pain, are subjective.

c. Here, the consultant will use only the word "effects".

4. The analysis of effects is difficult. In fact, an African economist believes that "project benefits or the economic and social impacts of the investment in sanitation cannot be measured because they are not usually quantifiable".*

5. Despite the potential difficulties of measurement, the following steps will constitute the recommended estimation of each major effect:

- a. Identify (describe) it.
- b. Assign a relative importance to it in comparison with the other effects also identified.
- c. Quantify it, if possible, but not in monetary units.

B. Work by EMAG to Prepare for the Analysis

1. Past through present (work already done)

- a. Descriptive work by EMAG and its associates on technical and social aspects of alternatives, including some effects (which have not been summarized very specifically):

* D. Getachew, "Financial Aspects of Sanitation" in IDRC, Sanitation in Developing Countries (IDRC Workshop, August 1980).

- i) Type 1 alternative [letrina mejorada] -- Done.
 - ii) Type 3 [servicio higienico de poco consumo conectado a alcantarillado de bajo costo] -- In progress.
- b. Consideration of effects in general terms by local economist in his reports and his commentaries on reports of other persons at EMAG.
- c. Estimation of effects on health status:
- i) Recommended by Dr. Solari.
 - ii) Rejected by EMAG team (See the response of Econ. Toro to Dr. Solari, "Comentarios Sobre Informe Dr. Solari", 6 Abril/82; this information was repeated to Dr. Robertson during his visit.)
- d. Agreement by EMAG team (in response to Dr. Robertson at a meeting) that the specification of the major effects of each program alternative, including conventional sewage disposal [alcantarillado convencional ("AC")], is a task of high priority that should be accomplished collaboratively by the multidisciplinary group of EMAG and its local economist.
2. Future (Work planned)
- a. The estimation of major effects stated above.

- b. Descriptive work emphasizing technical and social aspects of the Type 2 alternative [servicio higienico con tanque septico de una etapa] and of Type 3 when more experience has occurred.

C. Appraisal by Consultant of Work of EMAG

1. General opinion

- a. The work (done and planned) is good as far as it goes.
- b. However, more work is needed, especially to make the estimates of effects more specific; and some of that work probably should have been done earlier, as time now is short and this step is urgent.

2. The crucial multi-disciplinary team work

- a. This must be accomplished soon.
- b. It must include specific stated conclusions of the team as to the comparability of the effects of all alternatives, which in turn presumes clear specifications (definitions) of those alternatives, including their time patterns.

c. Definition of alternatives

- i) The definitions of the synthetic (combined) program alternative called "metodo secuencial" ("MS") and of the

conventional program ("AC") will not be simple, despite the apparent confidence shown in the original proposal (Propuesta, p. 32), but they are necessary; simplifying assumptions should be made to help on this task.

- ii) The study team -- assisted by the economist who can present economic considerations, such as the cost implications of alternative durations for using certain types of programs and of various interest rates -- must decide for itself what periods of operation to assume; for simplicity those probably should be the same time periods, although the true histories of AC and the others are different.

d. Among the comparative judgments to be made are these:

i) Do types 1 and 2 have fewer positive effects than Type 3? (That is plausible, but it has not yet been demonstrated.)

ii) Is Type 3 really comparable to AC -- for example, regarding disposal of excretas [aguas negras] and grey water [agua gris] and impact on health [salubridad]?

iii) How comparable is MS, especially to AC?

e. The composition of the permanent EMAG team and the identity and role of the local economist, are clear; no external economist is needed; EMAG can decide upon its need, if any, for a visiting consultant sociologist.

D. Recommendations by Consultant of Studies to be Conducted

1. a. The recommendation above for multi-disciplinary activities to determine effects soon is the crucial one (of Part IV) for the project, because the results will be needed for other work, including that on interpretations of costs (in Part VI).

b. Before the team can do its work, it probably will be necessary for the project head (Ing. Roura) to decide specifically upon the technical merits of the 3 types of alternatives and to decide upon their comparability in technical terms.

2. There is no recommendation to try to distribute shared costs among the multiple effects; it cannot be done well in the absence of data of monetary benefits. (See more on cost allocations in Part V.)
3. It is possible that the EMAG team will decide upon more ambitious studies of effects in the future, but that could occur only for the purposes of new, more extended projects, because such studies are not feasible in this project.

V. COSTS -- ESTIMATED

A. Nature of the Analysis

1. This part (V) and the next (VI)
 - a. Technically, this part (V) deals with a set of descriptive activities -- to measure (estimate) the costs of service (program) alternatives -- rather than an "analysis".
 - b. The next part (VI) of this report will cover interpretations of the costs that have been estimated, including cost comparisons of different alternatives, so it is more "analytic".
2. Basic objective of this part -- to estimate the following measures for each type of experimental program alternative in the project and for their combination (MS) and for the conventional program (AC):
 - a. Total cost of all inputs of resources for the program; and
 - b. Average cost of the alternative, which is expressed in terms of cost per "unidad", that is per "solar" or household served.
3. For costs, the inputs really used, not merely expected or budgeted, should be measured.

4. Resources (inputs) to include

- a. All resources used as inputs should be included as costs, no matter what source supplied and paid for them. (For example, EMAG funds outside of the project support drivers whose costs should be included for the project.)
- b. Resources contributed to the project (e.g., office and its utilities) should be included insofar as they can be identified.
- c. Resources used in all stages of activity on the project (design, investigation, construction, etc.) should be included, but costs will be estimated separately for each stage.

5. "Financial" and "economic" costs

- a. For the analyses, "economic" costs are most important.
- b. Thus, the following points must be considered to secure estimates that cover more than expenditures ("financial" costs):
 - i) Include also contributed resources.
 - ii) Adjust costs that are recorded at market values to reflect economic reality through application of shadow prices [precios sombra].

6. Perspective of analysis

- a. The broadest, and probably most useful, perspective for the analyses (such as cost estimation and interpretation) is the perspective of the entire society, and not merely that of EMAG or of the users.
- b. This implies that costs (and effects) must be complete and not merely those of EMAG or of the users.
- c. This opinion appears to be different from those once held by the EMAG study team (See Propuesta, p. 32).

7. Before costs can be estimated finally, all program alternatives must be defined specifically.

B. Work by EMAG to prepare for the Analysis

1. Past through present

a. General comment

Much work already has been done, with costs recorded in considerable detail, and the techniques for estimating costs gradually have become more thorough and satisfactory - for example, through inclusion of more categories of resources.

b. Summary of cost estimates already made

i) Type 1 alternative:

- . Preliminary estimates in a trial for part of 1982 - Informe No. 2 (dated Noviembre, 1982)
- . Extension for August-October, 1982 - Informe ..., by Ing. R. Carbo (1 Diciembre 1982)
- . Comments on August-October report by Econ. B. Toro (approximately January, 1983)
- . Responses with adjustments - Costos Definitivos de Construccion de Unidades Tipo 1, by Eng. J. Zambrano and Ing. R. Carbo (9 Mayo 1983)

ii) . Type 3 alternative:

- Basic report, incorporating methodological improvements suggested for Type 1 (above), covering May, 1983 - February, 1984 - Informe de Costos de Construccion de Unidades Tipo 3, by Ing. G. Viteri (in collaboration with Econ. B. Toro) (approximately March, 1984).
- . Comments on this work and the economic evaluation in general - Problemas de la Evaluacion Economica del Proyecto de Métodos Alternos de Disposicion de Excretas, by Econ. B. Toro (Marzo 1984)

iii) Type 2 alternative:

- a) Until the present time, only plans, because data collection is in progress

- b) A note: Additional units of this type will be constructed with funds of Plan Padrino, but that expansion will occur too late to be studied in the current EMAG project. In fact, there might be good reason for concern now about the speed of completing the project's own Type 2 units.

- c) Other reports on the EMAG alternatives exist, especially ones concerning technical aspects; although they might be useful in understanding costs, they are not cited by name here.

- d) This consultant agrees with the local economist (Econ. Toro) on his comments of March 1984, and will add more below as well as one additional comment at this point: the handling in the reports of non-recurrent inputs [no-recorrientes] is weak, as only vehicles have been depreciated. (See below for more detailed ideas.)

2. Future

- a. EMAG team, at the direction and with the active participation of its local economist, will revise its previous cost estimates for types 1 and 3 in response to:
 - i) Its own decisions (to be made, under the direction of Ing. Roura) on specific descriptions of each type, which will depend upon technical, social, and economic aspects.
 - ii) Its methodological improvements, based on the comments and decision of Econ. Toro, who will be the key person in the economic analyses, including estimation of costs.
 - iii) The recommendations of this consulting report, if accepted.

- b. EMAG (as composed above, with Econ. Toro as the crucial person) will complete the cost estimates for Type 2; these cannot be done, or any cost analyses accomplished, until the Type 2 units are fully constructed and in operation; that must occur soon enough to study costs.

- c. EMAG will estimate the costs of MS, as a synthesis of the costs of the components decided upon for MS (a combination of types 1, 2 and 3 with a particular time pattern). (See more in "C.2.")

d. EMAG will estimate (through sources mostly unknown to this consultant, though one surely will be Plan Maestro de la EMAG) the costs of AC.

e. Presumably, the study team will improve upon the format of each table contained in its new or revised cost reports (as well as other reports), including:

i) A clear title at the top;

ii) A complete "Source" note at the bottom;

iii) Some kind of clear specification of the time period for the results.

C. Appraisal by Consultant of Work of EMAG

(Note: This section, "C", is short and general. Readers can infer more of the appraisal by the consultant through reading his recommendations in section "D".)

1. More work is required in order to specify (define) each alternative and to identify the bases of defining Type 1 (can "ideal" combination of trial elements?), then Type 3, and perhaps similarly Type 2.

2. No cost estimates have been thoroughly planned or conducted for:

a. MS - Some technical decisions on its definition, to be made by the engineers, are required first; then economic factors, such as the useful life and cost of borrowed funds, can be applied by the economist to help the team reach its final decision on the definition; finally, the costs of "MS" can be estimated.

b. AC - Even rough (approximate) cost estimates of this are likely to be difficult to make, although they will be necessary.

3. EMAG team already has made highly detailed cost estimates for types 1 and 3; it is to be commended for the large volume of its work, even though some comments above and the recommendations below indicate that more is needed, within the limitations of staff and funds available to the project.

4. Some of the important weaknesses in the estimates already made are:

a. Omission or unclear handling of certain categories of resources (e.g., almost all indirect costs).

b. Limitations to the allocations of general costs.

c. Failures to estimate properly the annual costs of non-recurrent resources and to "discount" for timing of inputs.

d. Lack of sharp distinction among stages.

e. Lack of "shadow prices".

D. Recommendations by Consultant of Studies to be Conducted (and of Methodological Adjustments)

1. Include, for each program alternative, the costs of all categories of resources (inputs).

a. When costs will be needed:

i) Probably no adjustments of additions to the categories of resources (and costs) are needed for the trial (selection process) of Type 1, because it depended on technical and social factors, too, and because most of the omitted resources are general ones that are common to all varieties of Type 1.

ii) However, completeness is required in Type 1 and all other alternatives for all final cost estimates of the chosen form of the alternative.

b. Categories recommended - These categories of resources must be covered in the cost estimates:

i) Direct costs (assigned directly to each alternative):

a) Labor [personal] of all kinds and levels - Value of supplemental benefits [prestaciones sociales] must be included along with salary.

b) Materials

c) Equipment

d) Transportation -- Vehicle and its operation and maintenance (unless indirect cost)

e) Water -- if used appreciably

f) Other direct costs

ii) Indirect costs (allocated to each) - These should be estimated, if possible, but without an intensive process (perhaps incomplete):

a. EMAG office staff - General costs of project

b. Transportation (?)

c. Other indirect costs

- c. Include inputs (and their costs) wasted [desperdicios] and otherwise "unnecessary" in a separate group. (See below for presentations of these results.) EMAG team and its local economist have revised (improved) the treatment of these in the more recent reports.

 - d. Distinguish between recurrent resources [recursos recorrientes] and non-recurrent ones [no-recorrientes], because the former (recurrent) costs are incurred period by period while the latter (non-recurrents) are incurred once (or infrequently).
 - i) EMAG has not made this distinction; Econ. Toro will classify the resources for this purpose.

 - ii) Probably the only recurrent resources will be those used in the stage of Operation and Maintenance, including allocations of some current general costs to it; but the stage of Operation and Maintenance has not yet been reached (except, to a limited degree, for Type 1). (For the recommended handling of both of these classes of resources, see below.)
2. Improve the allocation (distribution) in several steps of general (shared) costs to final services, divided by program type (1, 2, 3). (Other costs can be assigned directly to Type 1 or 2 or 3.)

- a. EMAG cost report on Type 3 contains some improvements (e.g., in Anexo 7), but the work must be more clear and complete; allocations might be incomplete but even rough ones should be provided if possible.

- b. See "Figure 1" below for schematic presentation of cost estimation.

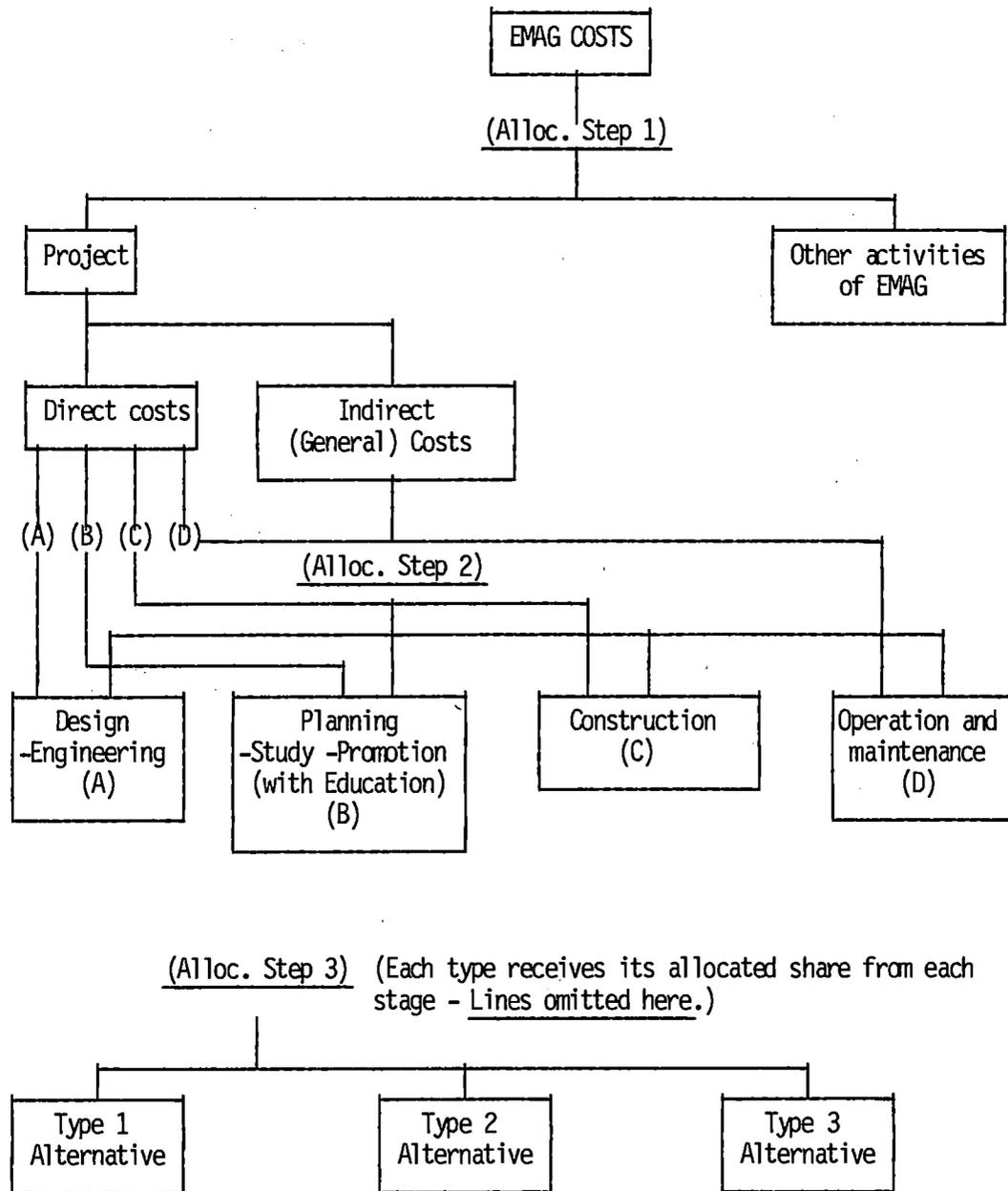
- c. Steps in the allocations:
 - i) Allocate an appropriate portion of general costs of EMAG as an entity (if known) to the project; if not known, note the underestimate of costs because of the omission.

 - ii) Allocate a portion of general costs of the project to each of its stages
 - a) Design-engineering
 - b) Planning-study-promotion (with education of community)
 - c) Construction
 - d) Operation and maintenance(Note: EMAG team might define these stages differently.)

 - iii) Allocate a portion of general costs of each stage to each program alternative (But see some doubt or qualification to this in "8.b. (4)" below.)

FIGURE 1

Schematic Presentation of Cost Estimation Process



(Alloc. Step 3) (Each type receives its allocated share from each stage - Lines omitted here.)

Notes: 1) Stages A and B incur costs before and during stage C, while the costs of stage D occur later.

2) a) "MS" costs will be constructed as a synthesis of those of types 1, 2, and 3.

b) "AC" costs will be estimated separately.

Source: Recommendation of R.L. Robertson

d. Allocative criteria - Selecting a criterion [criterio] of allocation for each step is somewhat arbitrary; suggestions of consultant for consideration by study team (especially Econ. Toro) are:

- i) EMAG to project - Probably best determined by team, if this can be done at all, based on rough percentage of general EMAG office space, staff support, and other resources used for project.
- ii) Project to stages - Perhaps based on percentage of team's professional time required for each stage, based on a simple time study to be conducted soon and quickly (depending, for certain periods, on memories).
- iii) Stages to alternatives - A difficult decision on criterion, best left to team, perhaps based on percentage of professional time required for each alternative (types 1, 2, and 3); certain costs can be assigned directly.

3. Handle non-recurrent resources by spreading their initial costs over their full useful lives [vidas utiles).

a. Reasoning - It is necessary to take into account the different times of (1) acquisition and (2) use of non-recurrent resources and, at the same time, to note the different potential durations of the various program alternatives.

b. Certain inputs might be handled more simply as "recurrent" ones -- For example, office space can be valued at its current rental equivalent per square meter.

c. Principal elements of this procedure

i) Obtain information concerning the timing of acquisition and use of each non-recurrent resource and an estimate of its useful life.

ii) Decide upon the preferred manner of allowing for the factor of time, recognizing that the "present value" (or current cost equivalent) of an input (resource) is higher if it must be acquired now rather than later - There are several possible ways of doing this; the consultant recommends the "annuity" [anualidad] approach whereby an annual cost is estimated for an input by use of a table which allows for the burden of incurring the original cost early, assuming a certain rate of discount [taza de descuento] (in effect, a time cost of funds); an illustration for an input with original cost of \$10,000 and a useful life of 10 years, when the discount rate of 12% is assumed:

Factor from table (known to Eng. Toro) for 10 year period and 12% rate = 5.65

Annual cost (for each year) of input = $\$10,000 \div 5.65$
= \$1,770 (rounded) per year

(This method assumes, among other things, a salvage value of zero at the end of 10 years.)

iii) Select the appropriate rate of discount, which is not easy, because economic theory points to several alternatives and conditions affecting the rate vary among countries and over time -- Econ. Toro has made a reasonable argument to the consultant in favor of a rate of about 12%, taking into account the practices of one or more international organizations, the existence of funds for projects like this one at a favorable rate [taza blanda], and a desire to promote equity through such projects by using a relatively low rate.

iv) Note: It is possible, even likely, that the non-recurrent costs of a particular program alternative can be handled as a package, rather than resource by resource as implied above.

4. Discount recurrent costs of a multi-year program when they are incurred after the starting year.

- a. This probably is not a major consideration in the EMAG project, because it is likely that the recurrent costs, especially for operation and maintenance will be relatively low.
 - b. Although discounting will not be visible in a diagram without using numbers, the process of accounting over time for costs - both the recurrent and non-recurrent ones - is illustrated in "Figure 2".
5. Divide cost estimates among different stages of project.
- a. As noted above, EMAG team must specify the stages, possibly modifying those suggested by the consultant.
 - b. The use of stages in cost allocations already has been shown (above).
 - c. Eventually, the crucial stages for analyses of each alternative will be those of "Construction" and "Operation and Maintenance"; their costs usually will include those allocated from the other stages, but an alternative presentation without such allocations also is suggested below.
6. Apply "shadow prices" where necessary to adjust the "financial" costs of certain resources in order to reflect their "economic" costs, particularly where market prices are distorted. (Econ. Toro is very clear on this point, as indicated in his

FIGURE 2

Time Pattern of Costs to be Accounted for in Comparing the Program Alternatives of the EMAG Research Project

Year	(7-year life) Type 1	(10-year life) Type 2	(10-year life) Type 3	(20-year life due to combin. MS)	(40-year life) AC
0	NR ¹	NR ²	NR ³	NR ¹	NR ^C (several
1	0	0	0	0	0
2	0 R ₁	0 R ₁	0 R ₁	0	. R ₁ ,
3	0	0	0 R ₃	0	. R ₂ ,
4	0 R ₁	0 R ₁ R ₂	0 R ₁ R ₂	0 R ₁	. R ₃
5	0	0	0	NR ²	. .
6	0 R ₁	0 R ₁	0 R ₁	0	. .
7	0	0	0 R ₃	0 R ₁	. .
8		0 R ₁ R ₂	0 R ₁ R ₂	0	. .
9		0	0	0 R ₁ R ₂	. .
10		0 R ₁	0 R ₁	0	. .
20				NR ³ (several . R ₁ R ₂ R ₃)	. .
30					. .
40					0 .
Total					

Notes: "MS" alternative assumes: Type 1 for years 0-4, Type 2 for 5-10, Type 3 for 11-20.

"Annuity" method used for non-recurrent inputs; it input is acquired after year 0, original value must first be discounted.

Recurrent inputs also are discounted.

Code: R₁ = Cleaning; R₂ = Other maintenance; R₃ = Operation;

NR = Non-recurrent input (here all non-recurrent together)

Superscripts refer to type of alternatives.

Source: None (hypothetical by R.L. Robertson).

commentaries, for example, on p. 10 of his annex to Informe No. 1 and p. 4 of his March, 1984 document; Dr. Solari also recognized this on his p. 14.)

a. Reasoning - This already has been presented by Econ. Toro and Dr. Solari, and is well accepted in economic theory, although it has not always successfully applied in practice in some other research projects; it should not require much study time despite its seeming complexity.

b. Types of resources requiring shadow prices

i) Labor [mano de obra]:

a. Skilled? - No

b. Unskilled? - Yes

ii) Materials and other imported resources:

Degree of adjustment should differ between resources that are composed entirely of imported elements and those partially composed.

c. Recommended handling

i) Direction of adjustment of market prices:

a. Unskilled labor - Downward, due to excess supply
(unemployment)

b. Imported resources - Upward, due to scarcity of foreign exchange and probable distortion of exchange rate.

ii) Coefficients of adjustment - Consultant endorses ideas (from discussion) of Econ. Toro, with hopes for documentation from a recognized economic or financial organization in Ecuador.

7. The time factor

a. Where some alternatives were constructed at different times than others (with differences of one or more years), the investigators should use roughly estimated values that would reflect the current costs of all alternatives (costs for the same year) in order to have a fair basis for comparison.

b. Predictions or projections of the costs of the alternatives over their full lives probably must be assumed to be in "constant prices" - adjusted for future inflation - although that might pose a problem in practice for comparisons of alternatives that have very different durations.

8. Presentations of results of cost estimation

a. Provide a summary of total cost estimates, resource category by category, for all program alternatives -- probably with one column per alternative.

b. Offer a series of alternative presentations of total cost results for each program alternative. (It probably will not be necessary to show these alternative results category by category; it should be done more simply in terms of total costs; the calculations for the adjustments or variations should be shown in supporting tabulations.) The recommended presentations are:

- i) With and without waste [desperdicios] and other "unnecessary" inputs, more than the normal ones of a program, that might require adjustments [ajustes]. (The need here is to avoid, or at least, reduce overestimates of costs due to the experimental nature of the project with its unusual costs.)
- ii) With and without contributed resources.
- iii) With and without shadow prices.
- iv) With and without allocations to "Construction" (and probably to "Operation and Maintenance") of the costs of the stages of "Design-Engineering" and "Planning-Study-Promotion": the need for these allocations will depend on the possibility of spreading these costs over more units later.

c. Average costs corresponding to the various totals above also should be tabulated.

9. Discuss briefly in this part, or in Part VI on interpretations if preferred, the following limitations to the cost estimates:

a. Inability to estimate economies of scale [economias de escala], even where they might vary among different program alternatives (especially AC in comparison with the others), due to a lack of data on costs in relation to scale (a common problem in practical research).

b. Suspicions of, but inability to estimate, certain effects related to samples:

i) Small size of the samples for types 1, 2, and 3 and, thus, for MS -- Inevitable.

ii) Selection biases through:

a. Choice by households to participate or not

b. Special nature of areas studied and perhaps of season of year.

VI. COSTS-- INTERPRETED

A. Nature of the Analysis

1. Basically, the nature of this part is obvious: to interpret analytically the costs that will be estimated by following the ideas in Part V (and to relate costs to effects if there is a difference in effects among programs).
2. There are two dimensions of cost interpretation:
 - a. In each alternative -- Identify the most important factors affecting its cost and draw conclusions concerning possible future changes in that cost.
 - b. Among the alternatives -- Compare them in order to assess and determine the lowest cost alternative(s), the principal objective of this economic evaluation.

B. Work by EMAG Investigators to Prepare for the Analysis

1. Past through present
 - a. Almost nothing of this kind of analysis has been done yet, except to use some costs along with social and technical information to select elements of Type 1 and to identify an "ideal" Type 1 program.

- b. This gap exists because the project simply has not yet completed the cost estimation phase, which must precede the interpretations.

2. Future

- a. There is general agreement among the EMAG team, its local economist, and external consultants that certain studies are needed for cost analysis, especially comparative ones.
- b. The following have been identified clearly through discussion with the team (See also Dr. Solari's consistent recommendations on his pp. 12-13.); they are listed below in the order of their priority for EMAG:
 - i) Studies to be done first -- Comparative average costs (per unidad) for:
 - a. Type 1 versus Type 2 - But caution will be required if their effects are judged to be different through the team's work recommended in Part IV.
 - b. Type 2 versus Type 3 (Same caution.)
 - c. No plan or recommendation to compare types 1 and 3 directly, because different effects are expected -- But

this decision could be changed when the results of Part IV are available.

ii) Studies to be done next -- Comparative average costs for:

AC vs MS

iii) Studies to be done finally (or before "2" if dictated by availability of cost estimates) - Comparative average costs for:

AC vs Type 3

C. Appraisal by Consultant of Work of EMAG . . .

1. The very limited interpretive work done to date probably was nearly inevitable, in view of the many other things to be done, but it leaves much to be done before the project ends -- in only six months.
2. This consultant endorses the above planned analyses, but adds the following clarifying comments.
 - a. Cost comparisons:

- i) Those planned are logical.
- ii) This consultant is less confident than the EMAG team appears to be concerning the feasibility of defining "MS" without ambiguity so that its costs and effects can be analyzed; this definition will not be easy.

b. Cost analysis or cost-effectiveness analysis?

- i) If effects are the same for the alternatives to be compared, cost comparisons will suffice.
- ii) If they are different, CEA (or cost divided by effect) will be necessary. (Econ. Toro can decide.)

D. Recommendations by Consultant of Studies to be Conducted

1. General

- a. As indicated and explained above, the cost comparisons planned by EMAG are recommended by the consultant.
- b. It should be stressed that cost-benefit analysis is not recommended.

2. Some particular considerations for the team's report

- a. The team should be prepared to discuss and interpret in its report on cost analyses the various presentations (and their effects on comparative cost results) that were recommended in Part V.
- b. The team should acknowledge the subjectivity involved in certain judgments, especially of effects.
- c. The team should very briefly identify (or repeat from an earlier section of its report) the probable directions of impact on results (biases) due to the major methodological decisions made and problems faced (e.g., on the samples).
- d. The team should recognize that the specific combination of program types and their timing chosen to create "MS" inevitably affects all the analytic results concerning that program alternative.

VII FINANCING -- COMMUNITY CONTRIBUTIONS AND OTHER ISSUES

A. Nature of the Analysis

1. General

a. The possible scope of the subject of "financing" is very broad, as it might cover, among other things: (1) community contributions (see more below); (2) "cross-subsidization" of poor persons' services by charging higher prices (rates) to richer persons; (3) the sources of financial support for services (and the merits of those sources); (4) affordability of services by the government; and (5) budget preparation and control.

b. Objectives of this project and the "Terms of Reference" of the consultant, supported by comments of the study team in Guayaquil, restrict the scope of this analysis entirely to "(1) community contributions". (There are no rich consumers in the studied areas, so no possibility of "cross-subsidization".); one additional study, concerning the costs of borrowing, also will be included.

2. Form of "community contributions"

a. They might cover: (1) direct contributions by users; (2) collective (group) funds; (3) Insurance.

- b. Only form "(1)" is included here.
3. Individual (or family) users' "contributions"
 - a. They might cover: (1) monetary payments; (2) contributed labor; (3) contributed materials.
 - b. Only "(1) monetary payments" are included, because the others have proven to be non-existent or negligible despite earlier expectations.
- B. Work by EMAG Investigators to Prepare for the Analysis
1. Past through present
 - a. Descriptive summaries of monetary payments:
 - i) Type 1 -- Payment of monthly charges [cuotas], but nothing else (Report of 25 enero 1984.) (Note: There is no plan to attempt to charge rates high enough to cover all costs of any type of unit.)
 - ii) Type 2 -- No charges yet; to begin soon when units are ready.
 - iii) Type 3 -- Purchase of water meters [medidores de agua potable] and, where necessary, of certain facilities such

as clothes washing sinks [lavaropas]; negligible contributions of materials; monthly payments (Report of 9 marzo 1984).

b. Some suggestive questions (e.g., "10" and "11"), but no more, in the social survey [encuesta social initial]

c. No analysis yet, except for:

- i) Some tentative judgments in the report for Type 1 (Informe de Participacion Comunitaria a Traves del Pago de Cuotas mensuales por Construccion de Unidades Tipo 1, 25 enero 1984); and those judgments appear to be too optimistic about financial support by the users.
- ii) Some rough suggestions for future tabulations and comparisons for all types (Programacion de Evaluaciones -- Guayas y Quil ... (y) Rosa Aguilera y Suburbio, (Febrero 28, 1984)).

2. Future

- a. Completion of descriptive summaries of monetary payments for types 2 and 3, when sufficient information on them is available.

- b. General intention of EMAG to analyze the contributions made and also comments by local economist (e.g., Problemas de la Evaluacion..., March 1984, pp. 2 and 6).

C. Appraisal by Consultant of Work of EMAG

1. EMAG was realistic in not attempting to charge a variety of different rates for new services, even though that decision eliminated a possible study issue (the effects of different prices, or rates, on payments made by the users).
2. The performance of the community, in terms of the types and amount of contributions, has been poorer than expected, even with rates at less than full cost; this is not the fault of EMAG.
3. Descriptions to date by EMAG of community experience
 - a. Adequate concerning monthly and other payments
 - b. Inadequate concerning income status of families [ingresos mensuales]:
 - i) Among participants-users -- Data are non-existent;
 - ii) In the general area or community -- Data are not yet analyzed.

- c. No analyses yet, and plans still vague -- Neither EMAG's documents nor the previous economic consultant's report appear to have yielded any specific team plans for analyzing community contributions.

D. Recommendation by Consultant of Studies to be Conducted

(General comment: Financing studies have lower priority for EMAG than those of costs and effects.)

1. Willingness to pay [disponibilidad de pago] of community

- a. Nature of this issue: How much is the community willing to pay for improved sanitation services?
- b. Ideas from the literature of economic development:
 - i) Some observers or analysts doubt that there should be, or at least can be, any charges for sanitation and certain other public health services*.

* D. de Ferranti, "Financing and Resource Allocation Issues in the Health Sector: An Overview" (World Bank, draft, October 4, 1983), pp. 29-30.

ii) Attempts to estimate willingness to pay empirically are in progress by the World Bank**.

a) Study group of World Bank has found partially encouraging results, more for potable water supply than for auxiliary health worker services, from asking the community members directly about their willingness to pay.

b) Such a study requires direct survey [encuesta] information from a sample of the full community, not just from users.

c. Conclusions of consultant

i) This kind of study, with a large survey, is not feasible at this late stage in the project; even at an earlier date, it would have been costly; perhaps it would be appropriate for a future, larger project.

** N. Birdsall, et al., "Willingness Pay for Health and Water in Rural Mali: Do WTP Questions Work?" (World Bank, draft, February 18, 1983).

- ii) The only work recommended for this topic:
- a) Use the indirect approach of comparing participant-users' family incomes (monthly average for the study year, if possible) with their specific (individual) performances in meeting their monthly payments [cuotas], in terms of their specific (1) rates of compliance and (2) percentages of incomes paid.
 - b) This study will be separate for each type of program alternative.
 - c) Unfortunately, the study groups will be very small and not representative of the total community.
- iii) The consultant does not recommend any elaborate, highly technical studies of economic issues, such as the "elasticity of demand" [elasticidad de la demanda] with respect to price or income.*

* For more on that issue, see E. Godoy, "Evaluacion Economica de Proyectos de Agua Potable Urbanos" (Banco Interamericano de Desarrollo, Enero de 1977).

2. Ability to pay [capacidad de pago] of community

a. Nature of this issue

i) Question: How much is the community able to pay for improved sanitation services?

ii) Note about this issue:

a. It is not the same as the previous one.

b. It introduces an important consideration for the equity of a program.

c. It does not deal directly with another important issue -- the capacity of the community to manage a collection scheme -- which is outside of the scope of this project.

b. An idea from the literature: an empirical project of the World Bank* is working on this -- Encouraging results from:

* N. Birdsall, et al., "Cost Recovery for Health and Water Projects in Rural Mali: Household Ability to Pay and Organizational Capacity of

- i) Community survey of (a) expenditure patterns and (b) incomes;
- ii) Use of those results to compare the two variables and draw conclusions concerning ability to pay.

c. Conclusions of consultant

- i) This type of study also is not feasible for the EMAG project, at least at this late time.
- ii) Recommended work:
 - a) Compare, for each type of program alternative, the average contributions paid (in 1983 and/or 1984) by users with the average income of the appropriate area found in the results of existing surveys for 1980 in El Guasmo and Suburbio*, adjusted roughly to a 1983-1984 level.

* Ministerio de Bienestar Social, report of 1981 survey, Parte II (for CISNE II or Suburbio) and Parte III (for El Guasmo), Capitulo VI in each part. (Note: Another source in Guayaquil concerning patterns of expenditure is too general and unfortunately includes the middle class; see Instituto Nacional de Estadística y Censos, "Canasta de Bienes y Servicios del Índice de Precios al Consumidor", 1968-present.)

b) Comment, for each alternative, on the relationship between the full cost per unit (regardless of who finances it) and: (a) the pattern of expenditures of all families in the area (See above survey, which, unfortunately, excludes recreation [diversiones y recreacion].); (b) the average income of the area.

3. Sensitivity analysis [analysis de sensibilidad] of effect of various possible rates of interest on cost of credit for a project

a. Nature of this issue: How do changes in the rate of interest specifically affect the total cost of a project that is financed by a loan?

b. This is of special interest to officials who might be considering a future, extended project loan with "soft" terms [credito blando].

c. Background to this issue for EMAG project

i) Econ. Toro agrees with the usefulness of such a study.

ii) Dr. Solari identified the importance of the rate of interest, apparently for this same kind of study.

iii) It is implied in the original proposal (Propuesta, p. 32).

iv) Study group has accepted it, but with lowest priority of the economic studies planned.

d. Conclusion of consultant

i) A brief study in simple, not elaborate, form is recommended, with details left to the local economist.

ii) It should receive the lowest priority of all, despite some possible usefulness for future proposals for projects of EMAG.

APPENDIX

ADDITIONAL COMMENTS OF CONSULTANT CONCERNING
CERTAIN MATTERS OF PROJECT ADMINISTRATION AND TIMING

This appendix covers certain practical matters that are not aspects of "economic evaluation". However, it is hoped that they are appropriate for inclusion in this supplemental part of the report. These comments are offered in order to try to help in the completion of a large and important research project that has only a limited amount of time left for its work (six months, on the assumption that there will be no further extension of its duration).

A. Pace and Type of Work of EMAG and Local Economist

1. All parties (persons) involved in this project are concerned that much work remains to be done within a limited time on the analyses that will constitute the economic evaluation of the project. This consultant offers the following comments (in brief) in response to that concern.
2. Suggestions for the local economist (Econ. Toro) (I believe that he already agrees with these.)

- a. Establish very soon a clear, very detailed (written) summary of economic studies that will be conducted in order to complete the project (Note, especially, the recommendations in this report.), and indicate a specific calendar of work times and dates (chronogram) for his participation in these studies, including writing the reports.
- b. Add to the above his written predictions of the support needed from EMAG for each study or group of studies, especially the research assistance (personnel) that he will need; it is anticipated that an assistant does not need to be one trained before specifically in economics.
- c. Prepare the data collection or recording forms and the structure of the tables which he will use, including those that he will ask an assistant to fill in.
- d. Discuss in the very near future his plans and requests for assistance with the key EMAG staff members (Ing. Roura and Ing. Zambrano), and secure their agreement (with or without modifications) on all of these plans; naturally, all the project's budgetary implications of the work should be clarified.
- e. Execute all this work, adhering to the above calendar.

3. Suggestions for EMAG (Ing. Roura and Ing. Zambrano) (I trust that these ideas are acceptable.)
 - a. Do the things implied or stated for EMAG in the above process.
 - b. Follow closely the progress of this work, including its reports.
 - c. Determine, and act on that determination, if any extensions of budget (perhaps with EMAG's own funds) are required, and also do any assignment of personnel necessary.
4. The consultant has not intended to interfere with the roles of the persons mentioned above by offering these suggestions.

B. Further Use of an External Economic Consultant

1. It appears to be agreed by all parties that the researchers would be helped by the work in the future of an external economic consultant, to be performed near the end of the project, including through a visit to Guayaquil.
2. The consultant's tasks
 - a. They would involve especially reviewing and commenting on all reports of the economic evaluation produced by the researchers;

where revisions were deemed essential, they would be recommended by the consultant.

- b. They would not involve any actual execution of studies or report writing by the consultant himself.
3. Details of logistics or practical arrangements to be made to secure the consultant (perhaps Dr. Robertson if he is available at the appropriate time) have been discussed informally by the parties during the current (March, 1984) visit of Dr. Robertson; these discussions will continue after his departure from Guayaquil and will include contacts with IDRC.