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MINIMUM EVALUATION PROCEDURE (MEP)

for water supply and sanitation projects

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The International Drinking Water Supply and Sanitation Decade

MINIMUM EVALUATION PROCEDURE
(MEP)

FOR WATER SUPPLY AND SANITATION PROJECTS

February 1983

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PREFACE

The International Drinking Water Supply and Sanitation Decade was launched in 1980. Decade programmes comprise interventions to provide clean and sufficient drinking water, adequate facilities for excreta disposal and hygiene education. These components complement each other and their combination greatly enhances the probability of achieving health improvements. The three components should be viewed within the broad context of Primary Health Care which links preventive measures with curative services.

The considerable investments in improved water supply and sanitation need to be protected by the allocation of adequate manpower and financial resources for operation and maintenance. Evaluations are essential to improve feedback from implemented projects and insure that past experience is taken into account when new projects are planned.

This document describes a relatively cheap, simple and quick method of evaluating water supply and sanitation projects. The guidelines are directed primarily towards managers of water supply and sanitation programmes in Member countries. In Chapter 1 the purpose of evaluation and the purpose of the MEP are discussed and a step-by-step procedure for evaluation is outlined. Indicators for the functioning and utilization of facilities are discussed in Chapters 2 and 3. Documented experience from impact evaluation studies is summarized in Chapter 4. Information on data gathering techniques is presented in Annex 1. A glossary of terms used in the document is given in Annex 2.

This document has been prepared by the Diarrhoeal Diseases Control Programme and the Environmental Health Division in cooperation with the Ross Institute of Tropical Hygiene, London. WHO Regional Offices have also contributed to the document. Representatives of five bilateral agencies, UNICEF and the International Reference Centre for Community Water Supply and Sanitation, The Hague, offered very constructive comments on an earlier draft. Some of the methodological aspects were tested in the Socialist Republic of the Union of Burma.

CHAPTER 1

EVALUATING WATER SUPPLY AND SANITATION PROJECTS

1.1 PURPOSE OF EVALUATION

Evaluation is a systematic way of learning from experience and of using the lessons learned both to improve the planning of future projects and also to take corrective action to improve the functioning, utilization and impact of existing projects. The evaluation does not in itself improve anything. It should not be just a listing of problems, and their possible causes, but should also include recommendations of the following types:

- (i) actions needed to
 - get a non-functioning facility into operation;
 - improve a functioning facility;
 - improve the utilization of facilities;
- (ii) complementary activities that need to be initiated or re-emphasized for benefits to materialize or increase;
- (iii) modifications needed to future projects;
- (iv) actions needed to ensure that lessons learned are conveyed to other programmes and other agencies.

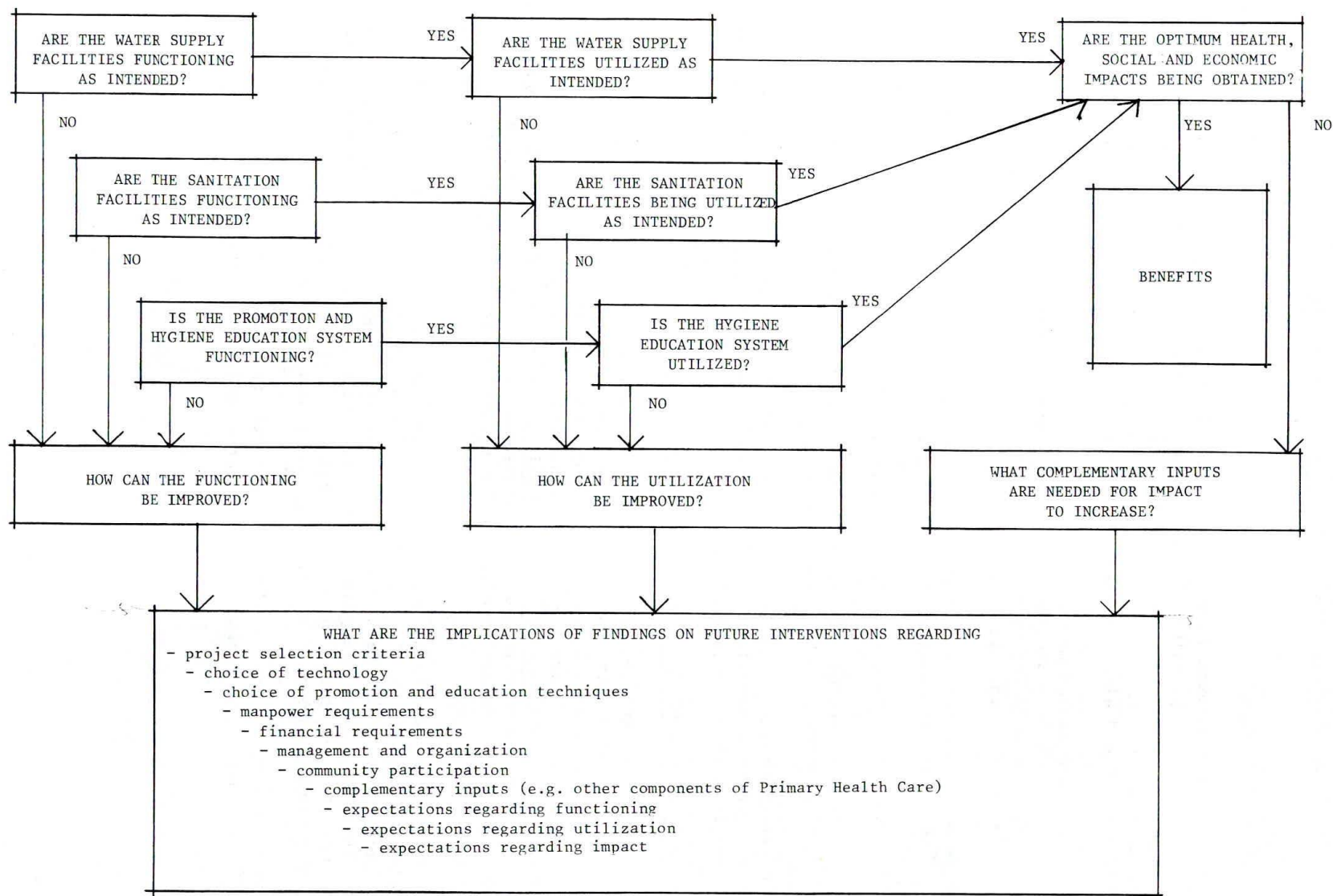
These recommendations can be arrived at without an evaluation of impacts. As this document does not include detailed guidelines on the design of impact studies it has been labelled "Minimum Evaluation Procedure" (MEP).

1.2 SCOPE AND PURPOSE OF THE MEP

The ultimate objectives of allocating resources for water supply and sanitation investments are to improve the health, welfare and economic status of the users of the facilities constructed. These objectives cannot be fully achieved unless the facilities are, firstly, functioning in the correct way and, secondly, utilized by the community. Thus, the MEP is designed to evaluate functioning and utilization and concludes with a discussion of impact study methodology and findings from documented impact studies. This approach is set out in Figures 1 and 2. Detailed guidelines for the evaluation of impact will be covered in a separate document.

The evaluation may focus on one or more of the three stages of functioning, utilization and impact (Figure 2). Deficiencies found in the evaluation of a particular stage call for improvements in the output of the previous stage or in the inputs to the stage under review. There is, therefore, little value in evaluating a particular stage unless the objectives of the previous stage have been largely achieved. Evaluation of impact is only appropriate for a project known to be correctly functioning and well utilized.

These guidelines are written primarily for projects which employ simple technologies. They are less appropriate for large urban projects employing sophisticated technology.



Note: YES = Yes, to a great extent.
NO = No, to a great extent.

Figure 1 : Questions to be answered in the evaluation of water supply and sanitation programmes

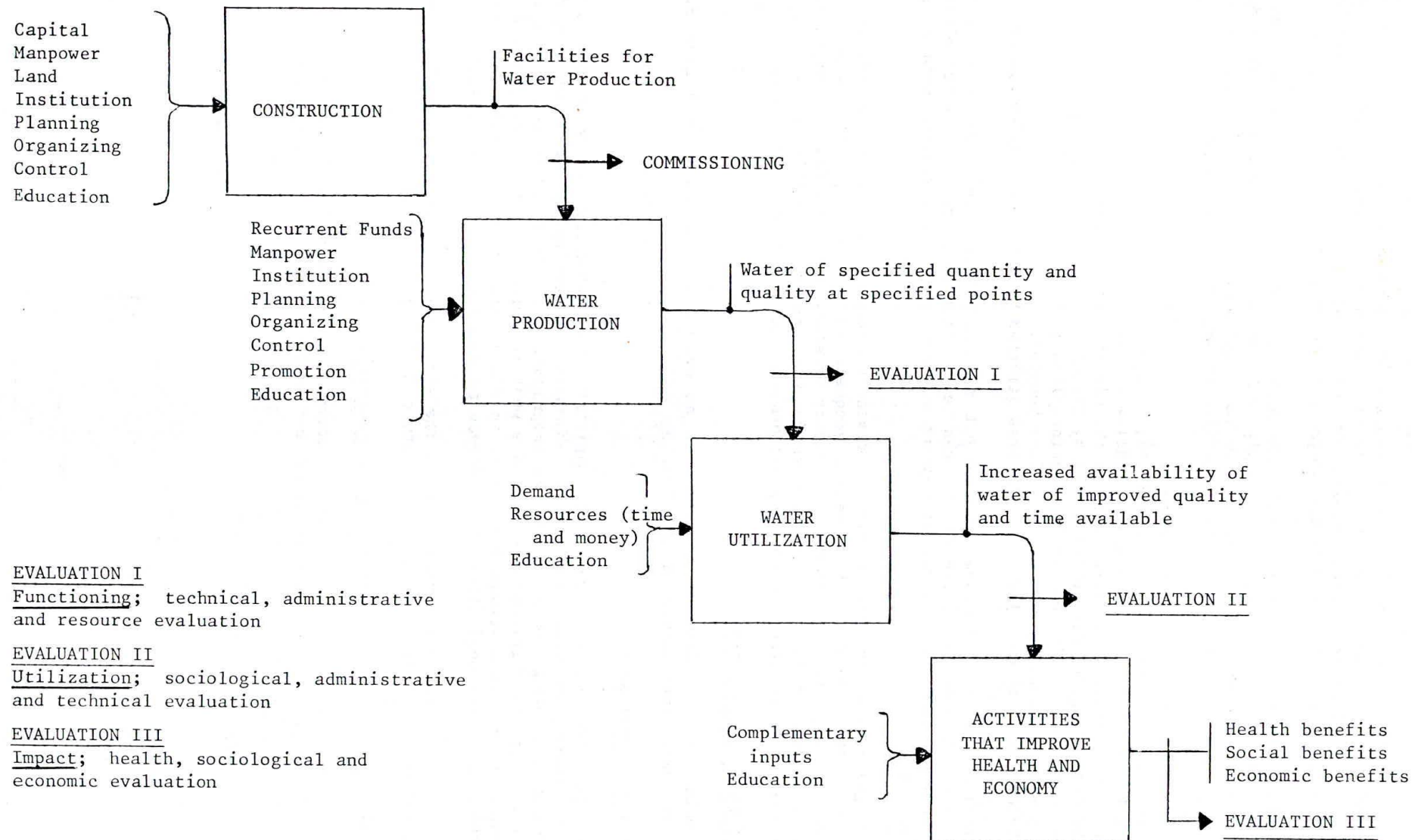


Figure 2 : Evaluation of benefits from water supply investments and intermediate steps

The guidelines are written for global application and can therefore not cover data collection, analyses and recommendations for corrective action to any great depth. They must be adapted to local conditions bearing in mind the purpose of the evaluation, institutional arrangements and technologies employed in the projects to be evaluated.

The guidelines are written primarily for managers responsible for the construction and/or operation and maintenance of water supply and sanitation programmes in developing countries and for others who may be responsible for conducting or organizing evaluations. The scope of any particular evaluation will be defined in one of the following ways:

- by ongoing or completed programmes;
- by geographic area (e.g. by province);
- by technology (e.g. handpumps on shallow wells);
- by agency (e.g. facilities built by the Ministry of Health);
- by donor (e.g. programmes supported by UNICEF);
- by age (e.g. facilities developed before 1970);
- by socio-economic group (e.g. landless people);
- by emergency or disaster (e.g. the area affected by a cholera epidemic).

Evaluations can be continuous, carried out regularly (e.g. annually) or at special points in time when maximum use of the results can be expected (e.g. prior to a new planning cycle, prior to negotiations with external support agencies or after disasters such as wars or natural disasters).

These guidelines do not recommend research-oriented sophisticated methods of establishing the linkage between clean water, adequate sanitation, hygiene education and health. Nor do they provide methodologies to conduct benefit/cost analysis. The emphasis is rather on the collection of basic information on the functioning and utilization of projects and the employment of this information to improve project and programme performance.

1.3 PROCEDURE FOR EVALUATION

The main steps involved in carrying out an evaluation are shown in Figure 3. A brief summary of these steps is presented below.

1.3.1 Decision to evaluate

The initiative may come from the ministry responsible for water supply and/or sanitation, the Ministry of Health or from the Ministry of Planning, possibly encouraged by an external agency providing resources for the programme. The level within the organization at which the evaluation is initiated may determine what follow-up action can be expected from the evaluation. The recommendations for action in the evaluation report should preferably fall within the area of responsibility of the person to whom the report is directed.

Some organizations have already reached the stage where evaluation is built into the planning process and therefore is a continuous rather than ad hoc activity.

1.3.2 Selection of person responsible for the evaluation

The person given the responsibility to carry out the evaluation should preferably be familiar with the project, or similar projects, but without having been so closely involved that the outcome might be biased.

DECIDE TO EVALUATE

SELECT TEAM LEADER

ESTABLISH TERMS OF REFERENCE

DESK STUDY

VISIT FIELD TO PLAN THE EVALUATION

DECIDE ON FOCUS OF EVALUATION

COLLECT DATA ON RESULTS
(Project and Programme Levels)

ASSESS THE DATA COLLECTED
(Project and Programme Levels)
AND DEVELOP ALTERNATIVE
SOLUTIONS TO PROBLEMS

PREPARE RECOMMENDATIONS AND
ESTABLISH PRIORITIES

REVIEW REPORT

INITIATE FOLLOW-UP ACTIONS

GET NON-FUNCTIONING FACILITIES
INTO OPERATION

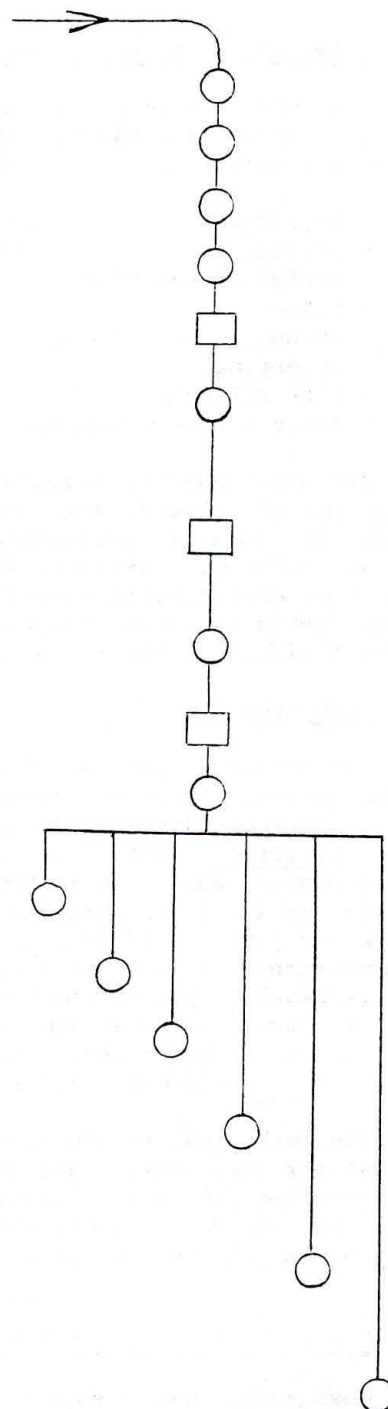
IMPROVE FUNCTIONING OF FACILITIES

IMPROVE UTILIZATION OF FACILITIES

INTRODUCE COMPLEMENTARY
ACTIVITIES FOR BENEFITS TO
MATERIALIZE OR INCREASE

MODIFY PLANNING, DESIGN,
CONSTRUCTION AND/OR OPERATION
AND MAINTENANCE OF FUTURE
PROGRAMMES AND PROJECTS

CONVEY LESSONS LEARNED TO OTHER
AGENCIES AND AREAS



LEGEND : ○ = Action
□ = Critical Review

Figure 3 : Procedure for Evaluation

1.3.3 Establish terms of reference for the evaluation

The person selected to be responsible for the evaluation should develop detailed terms of reference in close cooperation with the person(s) to whom he should be reporting. The terms of reference should define:

- objectives
- project area
- design of the study
- methods
- organization and manpower resources
- reporting
- time schedule
- financial requirements

The resources of personnel, time and money required to carry out the evaluation depend on the objectives, the depth of the evaluation and the size of the project being evaluated. The costs of evaluation will typically increase with the time taken, whereas the interest of those who initiated the evaluation has a tendency to decrease as time passes. There will be considerable variation in the time from initiation of the evaluation to the reporting, but this might typically be three to six months, with a four to six weeks concentrated effort in the field to collect the data.

1.3.4 Desk study

The person responsible for the evaluation needs some time to study the documentation about the project. The expected outcome of a community water supply and/or sanitation project is usually expressed in longer term development objectives as well as shorter term immediate objectives. The former are, as a rule, given in very general terms indicating that health, economic and social benefits are expected to materialize. Intended coverage (population and/or geographic area covered) and level of service (communal standposts or wells with handpumps, yard or house connections, number of people per water point, volume per capita for each type of service, water quality requirements, maximum distance to water points) are usually spelled out in the immediate objectives. Goals for promotion of consumer interest in new supplies and sanitation facilities, community involvement, community contribution to construction, operation and maintenance and education on hygienic use of facilities are usually expressed in the project documents.

The desk study should also include an analysis of actual cost data to establish unit costs (cost per individual water scheme, cost per person served, cost per latrine etc.) and the distribution of costs between the government agencies involved and the consumers. Documentation on the institutional arrangements for construction and operation and maintenance and pricing policies for the operational phase should also be reviewed at this stage.

1.3.5 Field visit to plan the evaluation

Most rural water supply and sanitation projects are spread over large areas. A short visit to a few sites at an early stage is almost essential to facilitate the planning of the evaluation. Note difficulties in the physical terrain, talk informally with field staff about their problems, note residence patterns, especially of disadvantaged groups, talk informally to a few householders; establish if there are severe problems with the functioning and/or utilization of the facilities and if there are large seasonal variations in supply and/or demand.

1.3.6 Decide on focus of the evaluation

The general purpose of the evaluation will have been established at the initiation of the exercise (Item 1.3.1 above). Information obtained during the study of project documents, and the field visit, will make it possible to define more precisely the focus of the evaluation. If the initial field visit revealed severe problems with the functioning of the facilities, there is no point in carrying out an evaluation of utilization or impact.

Some of the aspects to be considered in deciding on the focus of the evaluation are tabulated in Table 1.

Within a project that consists of a number of individual water schemes one might wish to emphasize functional aspects on schemes with functional problems; utilization aspects on schemes which function well but have utilization problems and for schemes with both satisfactory functioning and utilization a special impact study could be carried out (detailed guidelines for impact evaluation are not included in these "Minimum Evaluation Procedures").

Table 1 : Aspects to be considered in establishing the focus of the evaluation

MAIN PURPOSE OF THE EVALUATION	TYPE OF EVALUATION	CRITERIA	REMARKS
To establish actions needed - to get non-functioning facilities into operation - to improve the functioning of facilities	<u>Functioning of facilities</u> (Evaluation I, Figure 2)	At least some of the schemes within the project should have been completed	The focus is on (1) the physical systems and their engineering aspects and (2) institutions responsible for hygiene education. Recommended actions should be checked against the views, attitudes and desires of the community as the malfunctioning could reflect sociological rather than technical problems.
To establish actions needed to increase - coverage* - water and sanitation usage**	<u>Utilization*** of facilities</u> (Evaluation II, Figure 2)	The facilities and the educational services under review need to be functioning fairly well.	The focus is more on sociological and administrative aspects. Recommended actions should be checked against engineering feasibility and capabilities of education institutions as they might affect functioning. Recommended actions should also be checked against potential impact on health and economy of the community to ensure that they will result in positive results.
To establish benefits from water supply and sanitation investments. To establish actions needed to optimize benefits.	<u>Impact of the use of the facilities</u> (Evaluation III, Figure 2)	The facilities and education services under review need to be functioning fairly well, be reliable and utilized by a high proportion of the community	Recommendations made should be checked against engineering feasibility and acceptance by the communities concerned.

* COVERAGE = $\frac{\text{Number of people using the facility.}}{\text{Number of people living in the area the facility.}}$ $\frac{\text{Number of households who have built a latrine}}{\text{Number of households with access to the programme}}$

** USAGE refers to volume of water used per person; proportion of household members and households that use latrines that have been built; proportion of people who understand hygiene education messages.

*** UTILIZATION takes coverage as well as usage into account

1.3.7 Collection of data

Three main types of data need to be collected: data on functioning of the facilities and educating services, data on utilization of services and institutional and financial data related to the project. Somewhat different approaches are needed to collect these three kinds of data.

Functioning of facilities and education services should be assessed wherever possible by engineering inspection and scientific observation. For instance, a faulty pump should be inspected by a competent technician (not merely recorded as being faulty because of a report given by a user) and polluted water should be examined for enteric bacteria (not merely recorded as polluted because someone said it was). The opinions and attitudes of the users should be recorded, but they should be backed up by direct inspection and appropriate laboratory tests. A sample of consumers should be asked to comment on their perceptions of educational messages and approaches. If the project being evaluated consists of many individual schemes, time might not permit all schemes to be visited in which case a selection of representative schemes to be visited should be made by the evaluation team.

Utilization of the services should be recorded by a mixture of questioning users about utilization and corroborating this by observing utilization or signs of utilization (for instance stools around the yard are a sign on non-utilization of latrines). Factors that constrain people from using facilities, such as lack of money to buy water or soap, or fear that their children will fall into latrine pits, should be recorded.

Household information will always be required on utilization of services and will also be required on services provided for single households (e.g. house and plot connections or private latrines). Household information can be obtained in various ways, some of which are summarized in Table 2.

The least cost method of arriving at reasonably accurate definitions of problems with the functioning and utilization of facilities is to combine observation studies (Item 1, Table 2) with conversational interviews (Item 2, Table 2). The data gathering can be applied to whole villages, if they are small. For larger villages, stratified samples (Item 3, Table 2) can be taken.

Complementary information can be obtained at low cost through school children (Item 4, Table 2) and through community questionnaires (Item 5, Table 2).

A questionnaire survey (Item 6, Table 2) gives more precision to the findings and allows statistical analyses of the data. It requires, on the other hand, substantial resources for planning, training of interviewers, coding and analysis of data. A poorly planned and executed household sample survey can be very misleading.

The workshop method (Item 7, Table 2) can be used for definition of problems as well as for finding solutions to problems identified by other methods. Further details about the techniques for data gathering are given in Annex 1.

CHAPTER 2

EVALUATION OF FUNCTIONING

2.1 COMMUNITY WATER SUPPLY

Four indicators of the functioning of water supply facilities are described:

- W1: water quantity
- W2: water quality
- W3: reliability of the water supply
- W4: convenience of water points

There is a brief discussion of the target or the intention for each indicator, followed by a checklist of data required in the evaluation with guidance as to how the information can be obtained. In the section on assessment the discrepancy between the target and the findings is discussed and, finally, for each indicator suggestions are made about possible actions to take.

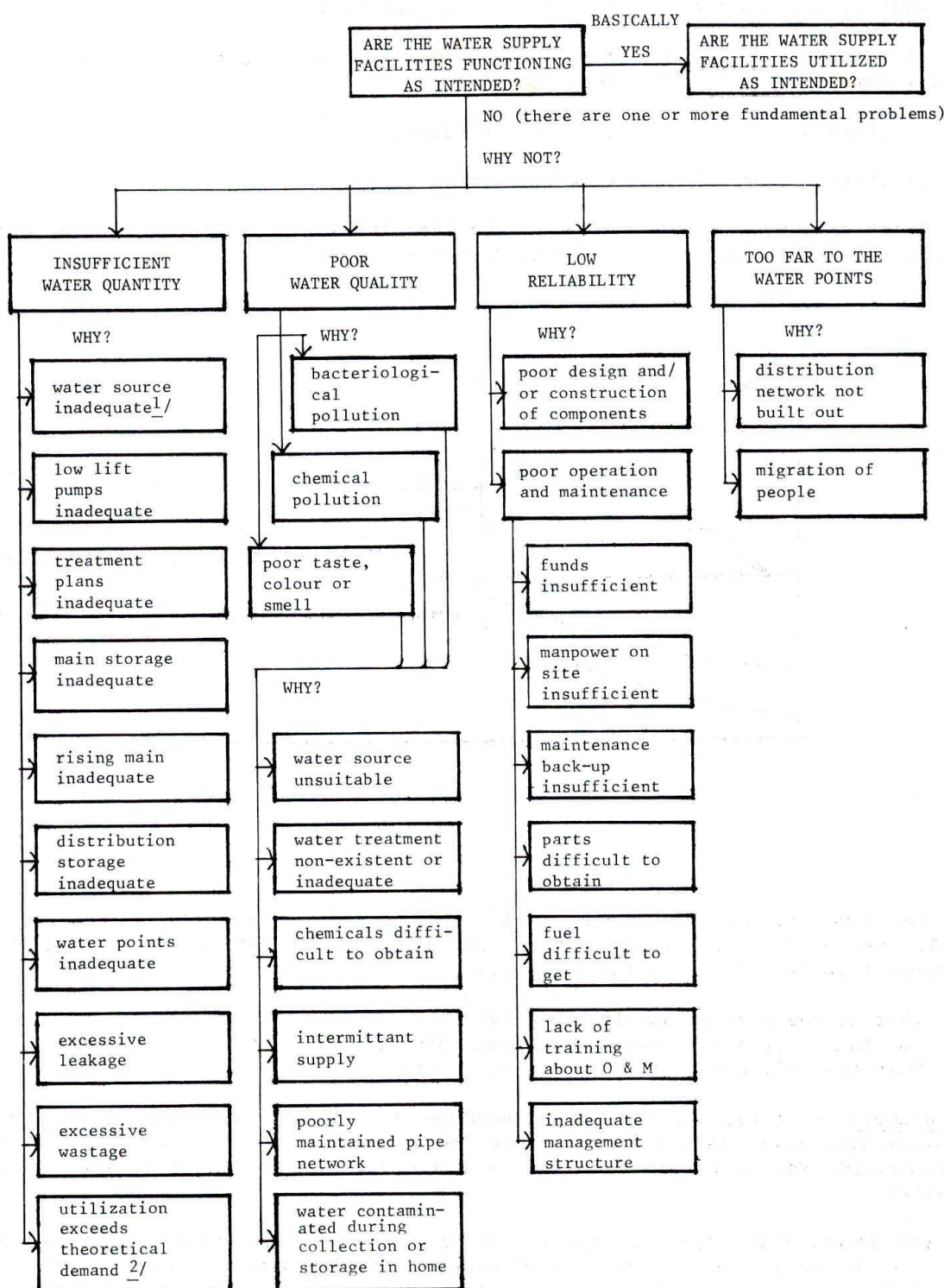
The indicators, and possible reasons for discrepancies between the intended functioning and the actual performance, are presented in diagrammatic form in Figure 4.

2.1.1 Indicator W1: water quantity

Target - The quantity of water to be provided is usually expressed in terms of litres per capita per day (l/c/d) in the project targets. The design criteria normally specify a variation in the provision of water depending on the type of service provided; e.g. standpost service 20 to 40, yard connection 40 to 80, house connection 50 to 150 l/c/d. The design criteria vary with climatic conditions and water availability. Allowance should also be made for watering of cattle and in certain cases depending on supply and demand, for watering of vegetable gardens. Increased demand with time due to population increase and shifts from communal water point service to yard or house connections is often considered in the design. Seasonal variation in the supply at source and in the demand are important factors sometimes overlooked in planning documents.

Data required - The information needed will vary with the type of technology used, in the case of piped supplies the following questions would need to be answered:

1. What is the present human and animal population within the supply area?
2. Based on the design criteria, what would the present consumption of water be?
3. Based on an estimate of the water losses in the system, what would the present production requirements be (in some instances the design criteria are based on a certain percentage of water losses in which case no extra allowance would be needed unless the losses are estimated to be very high - it is not unusual that only 40 to 80 percent of the water produced reaches the consumers)?
4. What is the present production of water in m³ per day?
5. For how many hours per day does the supply operate?
6. For how many days per week does the supply operate?
7. What has been the trend in water production since the supply was opened?



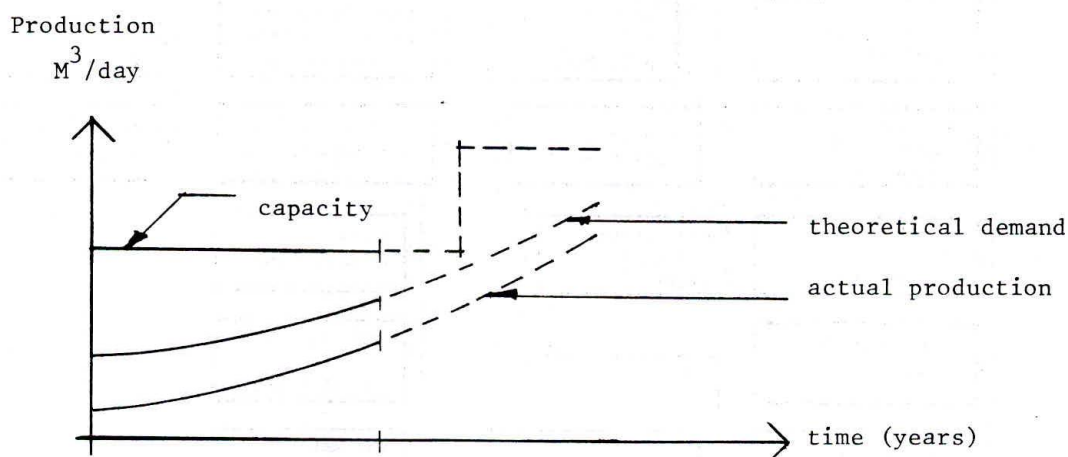
^{1/} Permanently or seasonally.

^{2/} Design fault or misuse.

Figure 4 : Malfunctioning of water supply and possible reasons therefore

8. What is the capacity of the supply in m^3 per day?
9. What is the capacity in m^3/hour (peak hourly demand might exceed average hourly demand by a factor of three to five)?
10. Is there a seasonal variation in the capacity?
11. Is there a seasonal variation in demand?
12. Which component of the supply is the limiting factor (the source, the treatment plant, the production plant or the distribution)?

Plot the data on a capacity/demand curve.



In the case of wells equipped with handpumps or open wells inadequacy in the capacity will result in long waiting time and will be reflected in the utilization. Questions relevant to the water availability are:

1. What is the maximum hourly capacity?
2. How many people are expected to draw water from the well?
3. Does the well dry up during the dry season?

Assessment - A big discrepancy between the actual and the theoretical demand could be an indication that there is a need to revise the design criteria. A water use study of a sample of households should be undertaken as a basis for such a decision (see Annex 1 for further details).

If the actual production is approaching or equal to the capacity of the system, the alternatives to be considered include: augmentation of the supply capacity, an education programme to reduce wastage, a leak detection and repair programme to reduce water losses or embargo on new house connections.

A low actual demand in relation to the theoretical demand might indicate the need for a promotional campaign, changes in pricing policy, improvements in the distribution of water points or a revision of design criteria.

Possible actions - Increased water availability might be accomplished through one or more of the following actions:

- decrease in water losses, that is a leak detection and leak repair programme;
- decrease in wastage through improved maintenance of taps and an educational programme;
- augmentation of the limiting component of the system (e.g. additional wells, increased pumping capacity, increased storage).

Increased water use might be accomplished through one or more of the following actions:

- promotional campaign;
- change in pricing policy;
- construction of additional water points;
- promotion of yard and house connections;
- extension of the distribution network.

2.1.2 Indicator W2: water quality

Target - The last edition of the WHO International Standards for Drinking Water was issued in 1971 and that of the European Standards for Drinking Water in 1970. These have now been revised and merged and will be published in three volumes in 1982-1983 under the title of "WHO Guidelines for Drinking Water Quality" as follows:

Volume I	Recommendations
Volume II	Health Criteria
Volume III	Sanitary Survey and Bacteriological Analysis of Rural Water Supplies.

The guidelines cover inorganic and organic constituents of health significance, radioactive materials, bacteriological and aesthetic quality. In the case of rural water supplies the latter two properties are usually more significant than problems with inorganic constituents (arsenic, cadmium, chromium, cyanide, fluoride, lead, mercury, nitrate, selenium).

The target should be to deliver safe water, which implies no bacteriological pollution and with acceptable chemical properties, colour, taste and odour.

Data required - There are two important aspects to water quality control, namely water analysis and sanitary surveillance. Sanitary surveillance can not replace analysis, but deviations from the conditions regarded as optimal for drinking water production can be discovered through a sanitary survey. Detailed guidelines on what to look for for various types of water supply systems are given in Volume III of the WHO guidelines referred to above. In some countries laboratory facilities are not available to the evaluation team. A sanitary survey by a person with the necessary knowledge, to detect problems and to suggest solutions will have to suffice. The quality of the water is determined by its microbiological, chemical and physical properties. If the source of the supply is surface water, and there is no treatment, then it is likely that the water is faecally contaminated, although it may be much less polluted than the traditional water source. By contrast, it is likely that water from a protected groundwater source is uncontaminated.

Faecal coliforms (largely *E. coli*) and/or faecal streptococci are the most suitable indicators of faecal pollution. They are relatively easy to enumerate, although laboratory equipment, such as an incubator that can maintain a steady temperature, is required. Water at the source and at the tap should be tested. If the water supply is chlorinated, and there is residual chlorine in the water at the taps, there is no need to carry out bacteriological tests.

A physical examination of the water may reveal discolouration, odours or tastes that might discourage people from using the water, even if they are not harmful.

The water may be subject to contamination between the tap and the point of consumption. If bacteriological testing is carried out, samples should be taken from storage vessels in homes as well as from the source and the taps to clearly establish if a possible quality problem is linked to the water supply or to the handling after collection of the tapes. For comparative reasons, samples should also be taken from traditional water sources. It is usual that some households continue to use their traditional source because they are not satisfied with the quality of the water from the new supply. It might be a question of taste (the water is considered too salty or the chlorine gives it a bad taste), or a question of belief (the new water makes the children sick, it sterilizes the women or it weakens the men). The problem can be real or imagined. People's views on water quality can be obtained through interviews. Peoples behaviour affecting domestic water quality may often be observed directly, e.g. storage containers uncovered, dippers put on the floor, topping up containers without regular cleaning. An observational study at traditional source can identify people who use the traditional source in preference to the new supply and they can be asked about the reasons for this choice. In countries with marked seasonality, observations should preferably be made both at the height of the wet and the dry seasons.

Assessment - As stated above the target should be no E. coli in drinking water. It may, however, not be practical to reach that target in the rural areas of many developing countries for some years to come. A tolerance level below which no immediate action would be taken might have to be established. When deciding on a tolerance level one should bear in mind the quality of the alternative water sources and if it is feasible to maintain treatment facilities if introduced. It is not unusual that a protected spring without chlorination contains 5-10 E. coli per 100 ml and in an unprotected spring the number might exceed 100.

Possible actions - Should the concentration of E. coli exceed the agreed limit, treatment facilities should be improved, or installed if non-existent, unless the source of pollution can be identified and removed. In many cases, introduction of chlorination would suffice. The implications are, however, that somebody must be responsible for the chlorination, there should be recurrent funds available for the purchase of chlorine and a logistic system for a steady renewal of the stock of chlorine or the treatment system will soon cease to function.

When highly polluted surface water is used, the installation of slow sand filters should be considered. It is a treatment process that is relatively simple and low cost. It does, however, require some maintenance and can be misused to the extent of becoming useless. Raw water from rivers that become extremely turbid during the rainy season might require presedimentation prior to the slow sand filter. Slow sand filters prepare water for subsequent chlorination.

Where the groundwater is found to contain high levels of fluoride (recommended upper limit for fluoride concentration in the tropics is 1.7 parts per million; the value might be as high as 5 in some national standards) action should be recommended. Other nearby boreholes should be sampled because the presence of fluoride may be very localized. The treatment process to remove fluoride is rather complex and costly, but cannot be avoided in some instances.

Removal of nitrate is difficult and costly and often not a practical proposition. An alternative source should be located.

Problems with the physical properties of the water might not cause health problems but might deter use. In such cases an educational campaign may help people to use safe water.

Where behaviour habits cause contamination within households, modification of that behaviour should be a special focus of hygiene education. Adult women should be the target group for these educational activities.

2.1.3 Indicator W3: reliability of the water supply

Targets - The reliability of the supply is normally not discussed in project documents. It is assumed that the supply will function continuously throughout the year. Alternative sources in case of breakdowns or severe drought should be considered.

Data required - Frequency and duration of stoppages in the supply of water are indicators of the reliability of the supply. Stoppages can be complete or partial; that is, a portion of the water points are not functioning or part of the system (such as the treatment plant) is not functioning.

If reliable operational records are kept the stoppages and their durations will have been recorded. This is possible only if there is permanent operating staff and, even then, records are frequently not reliable. The operating staff should be able to provide information about the relative frequency of the causes of complete and partial stoppages. A sample survey among the consumers will give an idea about the frequency and duration of stoppages, but probably little information about the real reasons for the stoppages. People are most likely to recall incidents of the supply being out of order if the alternative water source is far away or inconveniently located.

A low level of reliability can be the result of poor design and/or construction, but it is most commonly derived from inadequate operation and maintenance. If it is found that the frequency and duration of stoppages have been excessive, a detailed analysis of resource requirements for adequate operation and maintenance of the supply should be carried out, and an inventory of available resources compiled, in order to identify possible gaps.

Assessment - Complete reliability is an ideal that will seldom be achieved in practice. The degree of reliability that should be regarded as acceptable is a matter of judgement. This judgement will be influenced by the opinion of the consumers on the reliability of the supply and by the adequacy of the alternative water sources that are used during a stoppage.

Possible actions - Low reliability will be due either to poor maintenance, poor design, poor construction or a combination of these.

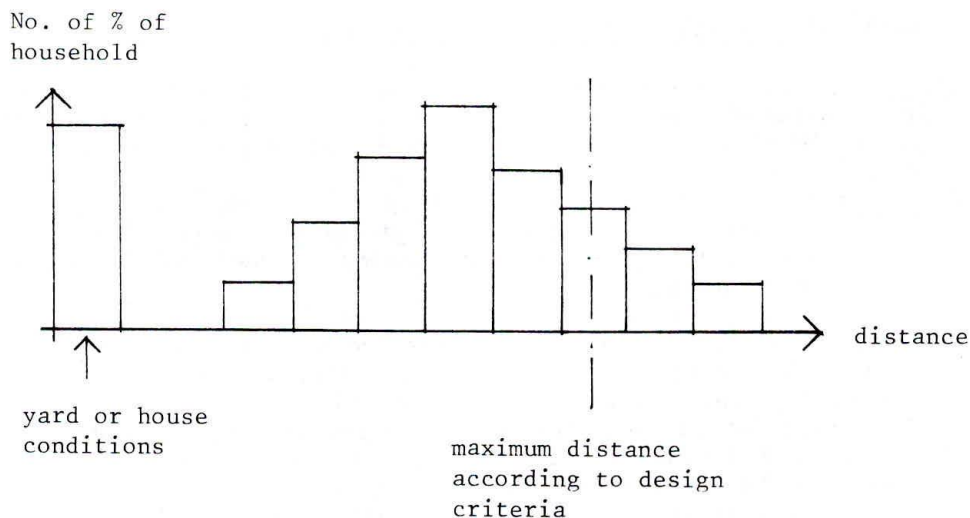
If poor maintenance is implicated, the whole maintenance system must be reviewed and improved. Some maintenance tasks will be the responsibility of government agencies or ministries, while others may rest with the community or the local government bodies. The necessary tasks must be clearly defined and the bodies responsible for them identified. Adequate financial resources must be available to pay for the various aspects of the maintenance system. The most common reason for poor maintenance is the assumption by central government that the community itself will be primarily responsible for maintaining its own supply, even though it is given inadequate support, training or money.

The remedies for poor design or construction will usually be self-evident. Poor design may result from incorrect choice of technology, especially a technology that is too complex or that uses a fuel that is not always available. Poor construction is often due to poor supervision of self-help labour.

2.1.4 Indicator W4: convenience of water points

Targets - A maximum distance from households to water points is often indicated in the design. In order to encourage use of the water points they should preferably be more conveniently located than the traditional sources. In areas with marked seasonality particular attention should be given to the fact that traditional wet weather sources (e.g. ponds) are likely to be in closer vicinity than that in use during the dry season.

Data required - What is the distribution of distances between households and water points? The distances can be estimated from drawings, maps or aerial photographs. The data can be graphically presented on a relative frequency diagram.



The type of terrain is obviously of importance in considering the energy consumed in the water collection journey, and should be noted at least for those with the furthest distance to the water points. Availability of bullock or donkey carts or other vehicles for water transport should also be noted and whether poor families can afford the cost of water transport. Information on the location of traditional water sources in the wet and the dry season are needed to assess the implication of the distribution of water points.

Assessment - A proportion of households will be located further from the nearest water point than specified by the project design criteria. The acceptability of this proportion must be judged. The judgement will be influenced by the proximity of traditional water sources, since many families will use a traditional source, even though it is polluted, if it is more convenient than the nearest water point.

The data on proximity will be an essential input to any evaluation of utilization (see Chapter 3) or an evaluation of the time saving impact.

Possible actions - If the proportion of households, located further from a water point than specified, is excessive, or if households are foresaking the new supply in favour of traditional sources more conveniently located, more water points should be constructed. A promotion programme to persuade people of the benefits of using the new supply, might also be introduced.

2.2 SANITATION

This section deals with excreta disposal facilities for individual households. Three indicators of the functioning of sanitation facilities have been selected:

- S1: proportion of households that have improved latrines;
- S2: sanitation hygiene;
- S3: sanitation reliability.

The indicators and possible reasons for discrepancies between the intended functioning and the actual performance are presented in diagrammatic form in Figure 5.

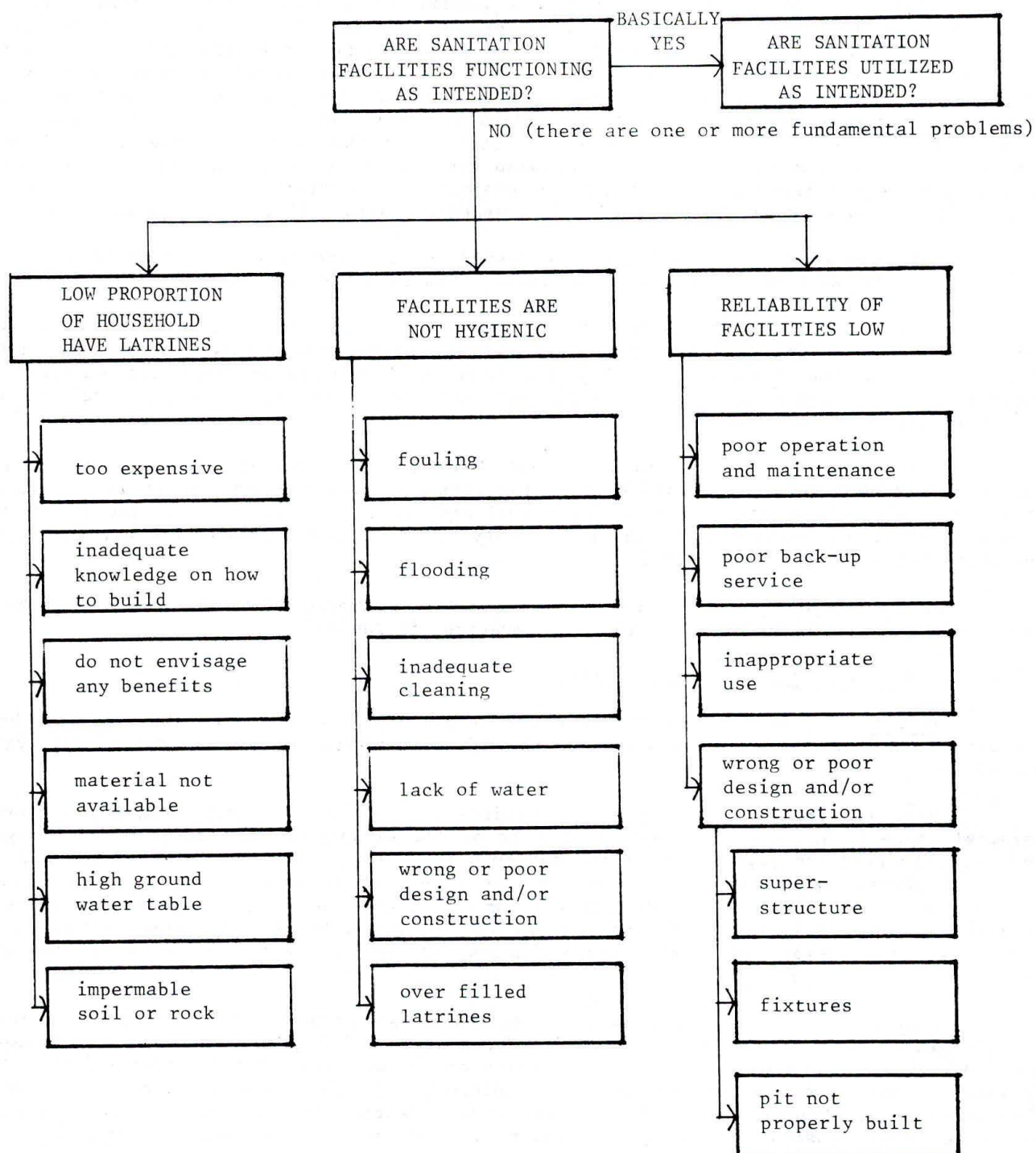


Figure 5 : Malfunctioning of sanitation facilities and possible reasons therefor

2.2.1 Indicator S1: proportion of households that have improved latrines

Target - Many sanitation projects depend on self-help construction, with the households providing the material and labour for construction of the superstructure and for excavation, and the government providing material not locally available such as squatting slabs, latrine pans and ventilation pipes. In order to motivate people to participate in the project, the government usually subsidizes partly or fully the provision of these materials or, alternatively, credits are arranged to allow repayment over several years. Governments normally train staff in the construction of latrines so that technical advice and help is made available to households. Governments also train staff to teach and promote aspects of hygiene that are related to the sanitation project. Demonstration latrines may be built. Usually it is assumed that all households in a specified area will participate in the project.

Data required - Information is needed on the proportion of households in the project area that have new or improved latrines. This is obtained by a house-to-house survey.

Information is also needed on the reasons for the non-participation of certain households. This is obtained by a survey of non-participating households to discover whether they know about the project. If they do, then further investigations are necessary to discover if they have chosen not to participate (and why), or they have been excluded (why and by whom).

Assessment - It is unlikely that 100 percent coverage of households can be achieved. If no target was established at the outset of the project, or if it was assumed that complete coverage would be reached, a realistic target should be set. The target will depend on local circumstances but should probably be 80 percent or above for any substantial community health benefits to materialize.

Possible actions - Possible actions needed to improve coverage will depend on the main reasons for non-participation and are summarized in Table 3.

2.2.2 Indicator S2: sanitation hygiene

Target - Unhygienic latrines deter people from using them. The aim must be to curtail insect breeding, smell and fouling through appropriate design of latrines and hygiene education.

Data required - The hygienic standard of latrines is best established through physical inspection. A grading system will be needed in judging the condition with regards to smell, fouling and presence of flies and mosquitoes (e.g. good, acceptable, bad and very bad). If several observers are involved in the survey it is important that they inspect a few latrines together to establish criteria for the categories. There are other indicators to look for which will vary with the type of latrine and with the cleansing customs in the area (e.g. presence of lid on the latrine, access to water, presence of water in the water seal).

Assessment - The data will be expressed as proportions of latrines having a certain grade of a certain characteristic. For instance, "30 percent of latrines inspected had bad fouling". Judgements are then necessary on the adequacy of these proportions. These judgements will be influenced by the opinions of the community on the various characteristics. For instance, if bad odour from a latrine is regarded as highly offensive and is a major cause of non-usage of latrines, then rather demanding standards for smell would be set in that area. Similarly, judgements on the breeding of flies and mosquitoes will be influenced by the people's opinions about these insects, but will also be influenced by whether the insects are known to be vectors of disease in the particular locality. In particular, mosquito breeding will be regarded more seriously in an area where Culex quinquefasciatus (a mosquito that often breeds in latrines) is the vector of bancroftian filariasis.

Table 3 : Reasons for not participating in a sanitation project and appropriate remedial action

MAIN REASON FOR NOT PARTICIPATING	FOLLOW-UP ACTION
Have not heard about the project.	Increase promotional activities.
Are self-excluded.	Interview to find reasons. Hold workshop to devise strategies for making project more attractive. Redesign aspects of the project if necessary.
Have been excluded by others	Identify social categories of the excluded by class, caste, ethnicity, sex, age, or other locally relevant categories. Hold workshop to devise strategies for extending the project to these groups.
Have not got the necessary cash	Arrange for possibilities of payment in instalments. Develop designs that are less costly. Increase government subsidy. Increase government subsidy for the poorer section of the population.
Have not got the knowledge or skill to build the latrine	Provide more technical assistance to the households. Simplify the design. Improve the training of extension workers. Build demonstration latrines.
Find the latrines unhygienic.	Improve designs and/or training and education.

Possible actions - Problems with hygiene and insect breeding may be corrected either by improvements in latrine design, or by increased promotional and educational activities, or by a combination of these. A good approach is to hold workshops with community representatives, local teachers, local health workers and similar persons to discuss the hygienic problems and recommend both design changes and any educational campaigns that may be necessary.

2.2.3 Indicator S3: sanitation reliability

Target - Failures due to inappropriate design, construction or maintenance can deter people from participation in latrine programmes and should be kept to a minimum.

Data required - Each type of latrine has a set of requirements for correct functioning. For instance, a ventilated pit latrine must have an intact vent pipe and mosquito screen, a pour-flush latrine must have an intact water seal, any latrine requiring regular emptying must be regularly emptied. The first step is to define the crucial requirements for the particular technology used in the project under evaluation. These requirements will then be surveyed in a house-to-house survey during which latrines are inspected. This survey can conveniently be combined with the survey of Indicators S1 and S2. For latrines requiring emptying by a centrally organized emptying service, enquiries will also be necessary at the headquarters and local depots of the agency providing the emptying service.

Assessment - There will no doubt be some failures in reliability, indeed, if there were none it could be an indication of overdesign. The frequency of failures should be very low however, or people could be discouraged from participation in the project.

Possible actions - Failures in reliability can be attributed to one or more of the following causes:

- poor design;
- poor construction;
- poor operation and maintenance;
- poor back-up services such as latrine emptying.

The primary causes need to be identified and the appropriate action taken.

2.3 HYGIENE EDUCATION

Each country will have to find the right mixture of mass media, folk media, and face-to-face techniques. The relative advantages and disadvantages of each are presented below:

Method	Advantages	Disadvantages
Mass media (example: radio campaign)	Informative. Can be centrally organized and executed.	May not reach linguistic minorities, the poor and those with little leisure. Messages may be misunderstood. One-way communication ineffective for encouraging and reinforcing new hygiene habits. Expensive.
Folk media (example: temple drama)	Entertaining and easily understood. Effective for giving new health insights through analogy and metaphor. Inexpensive.	Requires skillful organization and supervision by people wise in the local culture.
Face-to-face interaction. (example: community health worker treating diarrhoea and teaching prevention)	Two-way communication gives social support to those adopting improved hygiene behaviour. People learn through village activities. Curative and preventive services are linked.	Requires an effective primary health care structure in project villages. Good training and supervision of curative/preventive workers, and reliable support and supplies back-up are essential. Coordination with project staff is essential.

Hygiene education in support of water supply and sanitation projects is best carried out in the local language, by local people who are trusted and who are similar in ethnicity, class and life style to the project beneficiaries. Whenever possible it should be carried out within a system of primary health care services since adult women collect water, store water, handle food, clean latrines, dispose of baby's faeces and so forth, they should be the primary target audience. A separate vertical programme in hygiene education is not recommended. The four indicators of the functioning of the hygiene education component are:

- E1: understanding the language of the messages;
- E2: understanding the content of the messages;
- E3: access to the messages;
- E4: face-to-face contact with project staff and other educators.

2.3.1 Indicator E1: understanding the language of the messages

Target - The educational messages must be in a language that the great majority of women in the project area fully understand.

Data required - A representative sample of local women should be surveyed to ascertain the languages in which they are fluent and the languages in which they are literate.

Assessment - If the educational messages are entirely spoken, determine the proportion of women in the project area who are fluent in the language of the messages. If the messages are written, then the proportion who are literate in the language of the messages must be determined. These proportions should be very high. If literacy rates are low among women, only the relatively advantaged minority will be informed, and they probably already have a more hygienic life style.

Possible action - If an inadequate proportion of women are receiving the messages due to language or literacy problems, either the language should be changed, or the mode of delivery, or both.

2.3.2 Indicator E2: understanding the content of the messages

Target - The content of the educational messages should be readily understood by the target audience.

Data required - A representative sample of the target audience should be asked to explain the meaning of some hygiene education messages. Their responses can be scored on a three point scale: good understanding, some understanding, no understanding.

Assessment - If more than, say, 10 percent of interviewees have 'no understanding' of a certain message it indicates a major defect in the message or its mode of delivery. Local meetings or workshops may help to explain the lack of understanding and to elicit ideas on how the educational component may be improved.

Possible action - If the failure is in the message itself, the message should be redesigned. The cultural suitability of a message is very important. Messages should be built upon indigenous concepts of purity, pollution, cleanliness, etc. For example, in Islamic areas Koranic teaching is an effective basis for expanding concepts of personal and environmental cleanliness.

If the failure is in the delivery, consult local people on how to convey messages about cleanliness and redesign the presentations. Consider the use of folk media such as temple drama, traditional story tellers and fiesta clowns. Review recruitment procedures for community education workers to make sure they are not too distant in cultural and social terms from the people they are to educate. Women promoters and educators will probably be most effective in educating and convincing other women to adopt new health promoting habits. This is especially true with sanitation programmes where conversations about excreta may be embarrassing or immoral.

2.3.3 Indicator E3: access to the messages

Target - In most hygiene education programmes mass media will be used to some extent. Mass media include cinema, radio, television, newspapers, posters and pamphlets. There must be a high degree of access of the target audience to the mass media being used.

Data required - Determine the proportion of a representative sample of people in the target groups who have access to the mass media being used. People should be asked to state how many times in the last month they have seen or heard one of the project messages being disseminated in a mass medium, and to recall the content of that message.

Assessment - A judgement must be made on whether enough people are receiving the messages via mass media to justify the costs of the campaign. The proportion of people who at least should have access to the messages will vary with the local situation and depends also on the resources allocated to the mass media campaign. Specific criteria should be developed by the evaluating team.

Possible action - If insufficient people are receiving messages via specific mass medium, this medium should no longer be used and alternative media should be sought.

2.3.4 Indicator E4: face-to-face contact with project staff and other educators

Target - Staff in face-to-face contact with project beneficiaries can reinforce messages from mass media, can explain and amplify them to suit local situations, and can give encouragement to those who are modifying their hygiene habits. The target is to have as much face-to-face contact as possible between beneficiaries and (i) project technicians briefed in hygiene education, (ii) primary health care workers briefed on the projects aims, and (iii) adult literacy teachers, political party officials, school teachers, agricultural extension agents, social welfare workers and others concerned with public health in the project area. All should be briefed on the project and their activities integrated with decade goals through (1) an inter-ministerial national coordinating committee and (2) local area workshops.

Data required - Survey a representative sample to determine the proportion of people in target groups who have conversed with technical staff, primary health care workers, or other workers about environmental health in the past month. To assess both the quality and quantity of interactions, ask people to recall all such meetings in the past month, identify the person met and give the subject of the conversation.

Assessment - Record responses in a table and analyse which kinds of staff are most effective, and what kinds of knowledge and activities are being encouraged.

Possible action - If project technicians are unable to explain the health aims of their activities to beneficiaries a short course or workshop might be organized for them. If primary health care workers are inefficient, their training, supervision and duties might be reviewed. If other categories of health and welfare workers are not involved the national coordinating committee should be informed and workshops initiated in project areas.

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CHAPTER 3

EVALUATION OF UTILIZATION

3.1 COMMUNITY WATER SUPPLY

Two indicators of the utilization of water supply facilities are described:

W5: proportion of households using the facilities;
W6: volume of water used and for what purposes

3.1.1 Indicator W5: proportion of households using the facilities

Target - The target must be to encourage everybody within the supply area to use the facility, throughout the year, unless they have a private safe source of water.

Data required - Information is needed about who uses the facilities and who does not, the distance travelled by the users from their homes to the water points and the reasons why the non-users prefer, or are forced, to use the traditional source of water. The information can be obtained through observation studies at water points and traditional sources in the area and household surveys.

Assessment - The survey should result in an estimate of the proportion of households within the project area that are utilizing the facilities. A comparison between wet and dry season utilization should be made in countries with marked seasonality. The users should be subdivided according to which type of service they are receiving (e.g. individual house connection, individual or shared plot connection, communal water point, well equipped with handpump, etc.). The distance which people are travelling to water points should be noted. The non-users should be subdivided according to reason given for non-use, and seasonality noted.

Possible actions - The possible actions that can be taken to increase the proportion of households utilizing the services depend on the reasons for non-use. Some of the more common reasons and possible actions are listed in Table 4.

3.1.2 Indicator W6: volume of water used and for what purposes

Target - Water supply facilities are normally designed to cater for all domestic needs such as drinking, cooking, washing of food and utensils, personal washing and washing of clothes.

Water for domestic animals and possibly for watering of vegetable gardens may also have to be allowed for. Expected average per capita consumption is usually specified in the project documents, with specific quantities for the various levels of service provided (house connection, plot connection, standpost service, etc.). The facilities are usually designed to provide a year round service, although sometimes seasonal variations due to migration and seasonal use of alternative source are taken into account. Apart from providing better quality water at more convenient locations, water supply projects often seek to increase the volume of water used for domestic purposes, which in turn requires a change in water use patterns.

Data required - The information needed is the total daily use of water per capita for different levels of service and the allocation of the water used to various purposes. The data can be compiled through observations and interviews at water points and in households. Information about daily and seasonal use of alternative water sources should be obtained at the same time.

Table 4 : Reasons for not utilizing a new water supply facility and appropriate remedial action

MAIN REASON FOR NON-UTILIZATION	FOLLOW-UP ACTION
The traditional source is more conveniently located (in wet season or throughout the year).	It is likely that the distribution system will have to be improved if there is to be any substantial shift in the proportion of households using the facilities.
The cost of the water from the supply is too high.	There is a limit as to how much people are able and willing to pay for water. It is often stated that the upper limit of what a household can afford to spend on water is about eight percent of their cash income. If it is found that this reason is given predominantly among the poorer sections of the population, a change in pricing policy that would favour the poorer people might be the best solution. If those who give the cost as a reason for non-use generally live far from water points it could be that willingness rather than ability to pay governs their decision in which case improvements in the distribution system would be needed to make them utilize the facilities.
The taste of the water from the traditional source is preferred.	An advertising campaign might influence people to accept the water from the supply.
Fear that the piped water could make people sick, sterile or cause any other harm.	Look for the source of these ideas. For example, a political faction or religious group. Promote discussions to reconcile differences.
Water points not properly maintained and therefore unsanitary and avoided.	Improve maintenance of water points, possibly through more involvement of the users in the upkeep and allocation of clear responsibilities.
The water points are inconvenient to the children who usually collect the water.	Change the design of water points.
The supply is unreliable so the journey to the water point might be wasted and therefore the traditional source is preferred.	Improve operation and maintenance.
Involuntary exclusion for social, political or religious reasons.	This can be a very important factor and it might be necessary to provide special water points for the excluded group, unless the problem can be solved through negotiations.

Assessment - The findings should be compared with the assumptions made in establishing design criteria for the project. Account should be taken of factors that might constrain the demand, such as queuing at water points, and expected future changes in the distribution system that might decrease distances to water points and thus result in increased demands.

Possible actions - The actual use of water could be lower or higher than the design criteria. If water use is too low, it might be because water use patterns have not changed after the introduction of the supply. Promotional and educational activities, or a change in the distribution system, will be needed to increase water use. Alternatively, the design criteria might be revised to avoid over design of future projects.

If water use is too high, the criteria should be revised to avoid water shortage in future projects. Alternatively, if water use is extravagant it should be reduced by educational campaigns against wastage, by installing water-saving plumbing fixtures in houses with in-house connections, and by a progressive tariff policy to penalise heavy water users where water consumption is metered.

3.2 SANITATION

One indicator of the utilization of sanitation facilities is described:

S4: proportion of people using the facilities

3.2.1 Indicator S4: proportion of people using the facilities

Target - The target is obviously to get as many household members as possible of all households to use the latrines, particular attention should be given to toddlers and young children, who may require special arrangements.

Data required - It is very difficult to obtain correct information about who uses sanitation facilities. People are likely to state that the latrines are used by all, even if that is not the case. Observation of latrines to determine usage will be regarded as an invasion of privacy in many societies. A combination of subtle interviewing, combined with observations for signs of usage and non-usage, is likely to give the most accurate picture of the situation. Information on reasons for not using the latrines is of particular importance to identify corrective actions to be taken.

Information is needed on the use of the latrines by younger children. At what age do they start using the latrines? Where do they defecate before that age?

Assessment - Expected health benefits will not materialize if a large proportion of households, or household members, do not utilize the sanitation facilities.

Possible actions - Actions needed to encourage a larger proportion of people to utilize the latrines depend on which categories of people are not using them, and for what reasons. Some of the possibilities are summarized in Table 5.

3.3 HYGIENE EDUCATION

Three indicators are suggested for measuring the utilization of hygiene education. Behaviour in the project area may be compared with either a baseline study or with the behaviour in a comparison area.

- E5: water storage habits
- E6: handwashing after defecation
- E7: knowledge of oral rehydration

Table 5 : Reasons for non-utilization of latrines by categories of people and appropriate remedial action

CATEGORY OF PERSON	REASON FOR NON-UTILIZATION	FOLLOW-UP ACTION
Women	Not allowed to use the same latrine as men.	Separate latrines for women needed.
Children under 2	Too young.	Education for mothers and older children on the hazards of excreta from babies and the importance of clearing away babies' stools.
Children under 4	Facilities inconvenient for small children.	Modify the design so the facilities can be used also by small children. Alternatively, build separate shallow pits for the children.
Adults	Lack of water to wash after defecation therefore prefer to defecate close to water.	Provision of water points near to latrines and education of the importance of using latrines.
All categories	Latrines unhygienic due to smell, fouling, insects or not well functioning for other reasons.	Improve the design. Hygiene education for more appropriate use of the latrines.
All categories	Latrines inconveniently located.	Relocate the latrine or build an additional latrine.

3.3.1 Indicator E5: water storage habits

Target - One of the aims of hygiene education is to improve water storage habits. This includes a range of behaviour which guards the quality of stored water, such as keeping the dipper off the ground, regularly cleaning the container and keeping water containers covered. The target is that a greater proportion of the households in the project area should store their water in a hygienic manner after the hygiene education programme has been introduced.

Data required - The presence of a cover on the water container in households may be taken as a proxy for improved hygienic behaviour. Observe a sample of households in the project area and compare them with either observations in a baseline survey or in a sample of households in a matched comparison area which has not received hygiene education. These observations should be correlated with water quality surveys in the same households if such surveys are done as part of the evaluation (see indicator W2).

Assessment - If there is no significant change in water hygiene related behaviour it is an indication that the education techniques need to be altered.

Possible actions - Provide more community based demonstrations and activities. Work with local women's groups, community health workers and others who can reinforce hygiene education messages by giving social support and encouragement to women who adopt new habits. Also look for physical constraints that can be removed, such as lack of safe containers, inconvenient water points where women will not be prepared to "waste" water by tipping out the container and wash it.

3.3.2 Indicator E6: handwashing after defecation

Target - One of the aims of hygiene education is routine hand washing following defecation. The target is that a greater proportion of the people in the project area should wash their hands routinely after the hygiene education programme has been introduced.

Data required - The availability of water and hand washing materials near the latrine is taken as a proxy for actual hand washing. Observe a sample of households in the project area and compare them with either observations in a baseline survey or in a sample of households in a matched comparison area which has not received hygiene education.

Assessment - If there is no significant change in sanitation hygiene related behaviour it is an indication that the education techniques need to be altered.

Possible actions - Shift to more community-based education activities and use folk ideas to dramatize the danger of faeces. Also look for physical constraints. For example, is this a latrine project without concomitant provision of water and therefore water for washing is scarce? Are schools and public latrines sited without reference to available water for washing? If so, link water, sanitation and education in future projects.

3.3.3 Indicator E7: Knowledge of oral rehydration

Target - A component normally included in hygiene education programmes is to reduce infant mortality from diarrhoeal disease through teaching mothers how to prepare oral rehydration fluid, when to give it and how much to give. The target is thus to increase the proportion of mothers with knowledge about oral rehydration in the project area after hygiene education has been introduced. Should oral rehydration be part of the hygiene education programme under evaluation, the knowledge of oral rehydration can be used as an indicator.

Data required - The skills in oral rehydration among mothers is taken as a proxy for general health related behaviour. Interview a sample of mothers in the project area and compare their responses with mothers' responses either in a baseline survey or in a matched comparison area which has not received hygiene education.

Assessment - Correctness might be graded on a three-point scale:

- (i) does not know what oral rehydration fluid is
- (ii) proportions of ingredients or application is grossly wrong
- (iii) approximately correct

Possible actions - Link curative and preventive services in the context of primary health care so that workers who treat diarrhoea also teach skills to mothers. Look for physical constraints.

CHAPTER 4

EVALUATION OF IMPACT

The purpose of impact evaluation studies could be:

- (i) to establish if an investment in water supply, sanitation and/or hygiene education has resulted in improved health and/or improved economic status among those served by the facilities
- (ii) to establish the relative impact of investments in water supply versus sanitation versus hygiene education
- (iii) to establish the relative impact of alternative levels of service
- (iv) to establish economic rates of return for investments in water supply, sanitation and hygiene education to be compared with rates of return for alternative investments.

It has been shown in a number of evaluation studies that if water supply and sanitation facilities function well and are properly used, there is a reduction in disease morbidity, in particular in diarrhoeal diseases among children.

Twenty-eight health impact studies were reviewed in the World Bank publication by Robert J. Saunders and Jeremy J. Warford (Village Water Supply: Economics and Policy in the Developing World, 1976. John Hopkins Press, Baltimore). They found evidence that the incidence of certain diseases are related to the quality and quantity of water and sanitation facilities available to users. They found, however, that it was not possible to determine from the results of the twenty-eight studies how much health improvement can be expected from a specific water supply and sanitation investment in a specific area.

James Hughes made an assessment based on a review of forty-three published studies for the WHO Diarrhoeal Disease Control Programme in 1981 (Potential Impacts of Improved Water Supply and Excreta Disposal of Diarrhoeal Diseases Morbidity). He concluded that morbidity reductions of 20 per cent or more are usually statistically significant and frequently observed.

F. Eugene McJunkin has made a review of 200 publications (Water and Human Health, US Agency for International Development, Washington, July 1982). Among his conclusions are:

- There is health impact where safe water is readily available in adequate quantities.
- The present state-of-the-art of epidemiological forecasting makes it difficult, if not impossible, to predict with accuracy the incremental health status improvements that might be expected from incremental improvements in water supply and sanitation.

The evaluation of health impacts usually requires major investments of time and skilled manpower and should be limited to research projects with adequate resources.

Impact evaluations are generally more complex and costly to plan and carry out than evaluations of functioning and utilization of facilities. The translation of disease reduction into economic benefits is even more complex and requires the involvement of research institutions rather than government agencies responsible for water and sanitation programmes.

For these reasons evaluation of impact has not been included in the "Minimum Evaluation Procedures". A separate guideline for impact evaluations is under preparation.

ANNEX 1

DATA GATHERING TECHNIQUES

Throughout the guideline "the household" has been referred to as the unit to which water and sanitation programmes are directed.

There is no universal definition of a household. Many situations fit into the following definition: A household comprises a person, or group of persons, generally bound by ties of kinship, who live together under a single roof or within a single compound, and who share a community life. (Casley and Luvy, 1982). In many rural areas the household is a unit which consumes what it produces.

There are several methods of obtaining information on the availability, utilization and impact of water supplies, sanitation facilities and complementary hygiene education. The investigators may:

- (1) Make direct observations.
- (2) Hold conversational interviews with selected samples of households.
- (3) Survey stratified samples; the poorest and the wealthiest household clusters.
- (4) Use school children to collect household data.
- (5) Use community questionnaires.
- (6) Hold workshops to identify and solve problems.
- (7) Carry out a household sample survey.

A brief description of each of these techniques follows:

1. OBSERVATION STUDIES

Some of the factual information needed is best obtained through inspection or observation by enumerators. Three examples of observation studies are given below. Observations are most efficiently made in area cluster samples. Every latrine, water point or household in a few geographically defined project areas should be observed. These should be compared with observations made by the same investigator in comparison areas outside the project area. The comparison areas should be matched for socio-economic status, authenticity, climate, terrain and other relevant variables.

1.1 Inspection of latrines

Through inspection rather than interviewing more uniform criteria will be applied in the evaluation of the state of latrines. A simple protocol should be developed to ensure that indicators of problems with functioning and utilization of the latrine are recorded in a uniform way. A sample protocol is attached which could be modified and adapted to the local situation. The protocol must be tested before use on any large scale.

1.2 Observation at water points

Observations at water points over a period of several days can provide valuable information on waiting time at water points, peak periods of use, who collects water, type of containers used, volume of water collected per journey, use of water at the water point, etc. Interviews with the drawers of water can provide information on how far afield they have come from, number of journeys per day, frequencies of water point failures, etc.

For ease of recording and analysis a standardized protocol should be developed to obtain the specific information needed.

Similar observations can be made at traditional water points where interviews with those collecting water may reveal reasons for non-use of the water supply.

P R O G R A M M E:

PROTOCOL FOR INSPECTION OF LATRINES

Province:
District:
Village:
Inspected by:
Date:

1. Household identification _____

2. Superstructure, type _____

Functioning
Gives privacy
Gives protection from rain

Yes	No
☐	☐
☐	☐
☐	☐

3. Fixtures, type _____

Water in water seal
OR
Lid
Suitable

Yes	No
☐	☐
☐	☐
☐	☐

, if no specify what problem

4. Pit Yes No

Lined

☐

☐

Free Depth _____ meters

5. Cleansing material

Available

Yes
☐

No
☐

6. Water for handwashing

Available at what distance? _____ meters

7. General condition as regards,

Smell
Flies
Mosquitoes
Fauling

good	acceptable	bad	very bad
☐	☐	☐	☐
☐	☐	☐	☐
☐	☐	☐	☐
☐	☐	☐	☐

8. Any other comments?

1.3 Observation of behaviour effected by hygiene education

At a minimum, hygiene education programme would encourage handwashing following defecation and protection of stored water in the home. Observe all households in area clusters to see if water for handwashing is available near the latrine. Ask to see the handwashing material (soap, sand, etc.). Ask to see household water storage containers and note if they are covered. In some areas people may traditionally cover their containers. If so, investigators should ask how frequently the container is emptied and cleaned. Since these verbal responses may be idealized statements of what should be done rather than what people actually do, a few observations of women bring water home will help to evaluate the accuracy of verbal responses.

2. CONVERSATIONAL INTERVIEWS

When a particular utilization problem, such as fouled latrines, is identified, select a sample of households that exhibit this problem. Have a very brief interview schedule of 3 or 4 open questions. Discuss these questions with all members of the household who are present, especially adult women. The questions should stimulate the householders to talk about the problem as they perceive it, and to suggest solutions. The investigator stimulates the conversation and lists all responses. Later, responses are classified and tabulated.

These conversations should reveal the householders' economic, physical and social constraints. For example, they may lack water for washing the squatting plate, and the solution is to integrate the provision of water supply and latrine building in the same area. Or, the latrines may be fouled from high water table flooding in the wet season and the solution is mounted latrines. If the area around the latrine is fouled it may be because people are afraid children will fall down the pit, and demonstrating the strength of the squatting plate may make a difference or shallow children's pits might be encouraged. In a further example, if men and women (or certain categories of kin) should not use the same latrine the solution might be a superstructure with two cubicles over the pit.

3. COMPARISON OF TWO CONTRASTING STRATIFIED SAMPLES

In some project areas poor people live in easily identified residential clusters. They are the group most likely to lack money to obtain new latrine materials, or water from a water project with water charges. They are also the group that more educated health workers and teachers tend to overlook in favour of their equals with whom conversation is more comfortable. Therefore, if resources for an evaluation (time, money, trained personnel) are scarce, those poor households, with the worst health status, should constitute a minimum sample. This sample should be compared with a stratified sample selected from the most wealthy households in the project area. Households not sampled are presumed to fall somewhere between these two extremes.

4. USE OF SCHOOL CHILDREN IN DATA COLLECTION

In some instances, particularly when the proportion of children attending school is very high, a good data base on the functioning and utilization of water supply and sanitation facilities can be obtained at a low cost with the help of school children.

A procedure along the following lines could be followed:

(i) Select schools

School within possibly both the project area and a comparison area to be selected.

(ii) Discussion about the issues at the schools

The persons responsible for the evaluation to arrange for say one half day's discussion with the 15 best pupils in one or several classes at each school. The older the children are, the more reliable will be the information they obtain. The bias will on the other hand also increase with the age of the children as it is likely that children from families with higher socio-economic status, and therefore better water supply and sanitation facilities, are over represented in the higher classes. The optimal age is likely to be between the age of ten and fourteen years.

Alternative water supply and sanitation facilities available to the households could be discussed with the children and a simple questionnaire developed together with them. The number of questions should not exceed ten and preferably be limited to five.

(iii) Questionnaire filled in by the school children

After the questionnaire has been duplicated the children could be asked to interview their parents and fill in the questionnaire at home. To increase the sample they could be asked to interview one or more neighbouring households who do not have children in the classes concerned. In that way the bias referred to above could also be reduced.

(iv) Discussion of the findings

When children return their data sheets, the sheets should be sampled and discussed with the students to ensure accuracy. When the results are presented to the students, they might be asked for further clarification on some of the issues.

5. COMMUNITY QUESTIONNAIRES

An alternative low cost method of obtaining information on the functioning and utilization of water supply and sanitation facilities is to prepare a questionnaire for a whole village or other administrative unit. A committee with the village leaders including the village health worker, if there is one available, could be requested to provide the information. One possible problem with this method is that the situation for poorer sections of the population might not be reflected as they are likely to have less influence on the committee than the more well to do households.

Another problem is that there will be a considerable variation in the quality of the data obtained from one village to another.

6. WORKSHOPS TO IDENTIFY AND SOLVE PROBLEMS

A relatively low-cost method of problem identification is to hold workshops with those concerned with the project under evaluation. Those who have been involved in the planning, design and construction and those responsible for operation and maintenance and, most important, the consumers should be represented. The consumers should be represented by a group of people to avoid being totally outnumbered by the technocrats and reluctant to participate fully and frankly in the discussions.

The programme should be structured and cover functioning, utilization, organizational and financial aspects. The workshop should preferably be held in the project area with field visits included in the programme.

The workshop method can also be very productive in arriving at possible solutions to problems that have been identified through the workshop or through any of the other methods outlined in this Annex.

7. HOUSEHOLD SAMPLE SURVEY

The most common method of data gathering if the results are to be statistically analyzed is a household sample survey where information is obtained through an interview with an adult member of the household based on a questionnaire. The procedures for a household sample survey are elaborated upon below:

- (i) Establish how many households are needed in the sample
Consultation with a statistician is needed.
- (ii) Establish sampling procedures
Consultation with a statistician is needed.
- (iii) Develop a draft questionnaire or interview schedule (compare with item 2 above)
Attached is a questionnaire that could serve as a checklist. The questionnaire must always be adapted to the local situation. Many of the questions in the example will have to be modified (e.g. question No. 5). In the draft questionnaire it is best if some questions are left open without alternative answers listed (questions 15, 19, 25 and 29 in the example are closed questions; they have alternative responses listed).
- (iv) Test the draft questionnaire and develop it further
The draft questionnaire should be thoroughly scrutinized through a pilot survey of some interested household members who would be subjected to the questionnaire. At this stage free responses to some of the open questions should be categorized and the suitability of changing them into closed questions decided upon. If all questions are closed from the beginning there is a risk that responses of importance are overlooked altogether. At the testing one would also establish if additional questions are needed and of equal importance if the answers to some of the questions are already known which would make the questions superfluous. It is important that the questionnaire or interview schedule is kept as brief as possible.
- (v) Translate the questionnaire and test the translation
If the draft questionnaire has been developed in a different language from its final form it is very important that the translation is thoroughly checked. This is best done through an independent translation of the final questionnaire to the language in which it was drafted and then a comparison with the original draft.
- (vi) Duplicate the questionnaire
The layout is very important and should be designed with ease of reading, recording and interpretation in mind. Printing should only be done on one side of the paper and the size and quality of paper selected to facilitate the work of the interviewer.
- (vii) Establish how many interviewers are needed
It is common to underestimate the average time required per interview. Proper consideration should be given to the time it takes for transport at the beginning and end of the working day and transport between households.
- (viii) Train the interviewers
Even the conducting of interviews on the basis of relatively simple questionnaires will require training of the interviewers to ensure that they can introduce themselves and explain the purpose of their interview to householders in a satisfactory way, that they are familiar with the subject of the interview so that they can answer questions that householders might raise, that they thoroughly understand all the questions and can carry out the interview and record the answers in a confident manner.

- (ix) Establish logistic back-up needed
Items to bear in mind include; transport for interviewers, printing, distribution and collection of interview forms, salaries and per diem for interviewers.
- (x) Inform the people concerned
Before the survey can start in a project area, people concerned should be briefed on the purpose of the survey. Village leaders and government employees concerned with the project on the site should be thoroughly informed and given an opportunity to ask questions and make suggestions for the organization of the survey.
- (xi) Carry out the survey
If the households to be interviewed are selected randomly, instructions should be given on how to handle non-response. If no adult household member is present, an effort should be made to make a second visit to minimize the chances of getting a bias sample.
- (xii) Data analysis
See the text under each indicator in the main body of the guideline.

P R O G R A M M E:

HOUSEHOLD SURVEY QUESTIONNAIRE

Province:
District:
Village:
Interviewer:
Date:

Indi-
cator

1. Household identification

(Use number from sampling frame)

W1 2. Number of household members

Total

Adults		Children < 5 years		
M	F	M	F	

3. Socio-economic status

(Use plot size, house size, number of cattle, educational level
or other locally relevant indicators of wealth and/or income.)

WATER SUPPLY

W5 4. Are you using water from the community water supply?

Yes ☐ No ☐ , of no continue to Question 17

W5 5. What type of service do you have?

- House connection ☐ , continue to Question 9
- Plot connection ☐ , continue to Question 9
- Communal water point ☐
- Well with handpump ☐
- Well without handpump ☐
- Other ☐

W4 6. How far away is the water point? _____ meters (estimated)

W4 7. How long does it take to go there,
fetch water and come back? _____ minutes (estimated)

Indi-
cator

8. Who collects the water?

Children

Women

Men

Usually	Sometimes

W6 9. How much water is collected each time? _____ litres (estimate)

W6 10. How many times a day is water collected? _____

W3 11. When was the supply last not functioning? _____

W3 12. How frequently do breakdowns occur?

Never ☐ Dry Season ☐ Monthly ☐ Weekly ☐

Other ☐ , specify _____

W3 13. For how long do breakdowns last? _____

W5 14. How much do you pay for the water service? _____

W6 15. For what purpose is the water collected being used?

Activity

Approximate estimate of
percent or proportion

Drinking and cooking

Washing of food and utensils

Personal washing

Washing of clothes

Watering of animals

Watering of garden

Other, specify

100%

W6 16. Do you use any other water source for any of the above activities or any other activities? _____

Indicator

W5	17.	What water source do you use for the following activities? (This question only applies to those who are not using the water supply.)		
		<u>Activity</u>	<u>Water Source</u>	<u>Distance</u> (estimate)
A. <u>DRY SEASON</u>		Drinking and cooking	_____	_____
		Washing food and utensils	_____	_____
		Personal washing	_____	_____
		Washing of clothes	_____	_____
		Other	_____	_____
B. <u>WET SEASON</u>		Drinking and cooking	_____	_____
		Washing food and utensils	_____	_____
		Personal washing	_____	_____
		Washing of clothes	_____	_____
		Other	_____	_____

W4 18. What is the distance from your house to _____ meters
the closest project water point?

W5 19. For what reason(s) are you not using the water supply?

Traditional source more convenient	☐	} Some probable categories, actual categories to be established through pilot interviews
Water supply too expensive	☐	
Water from the supply does not taste good	☐	
Considers water from the supply unhealthy	☐	
Conditions at water point unsanitary	☐	
Children cannot reach or turn the tap	☐	
Children cannot operate the handpump	☐	
The supply is unreliable	☐	
Would like to participate but cannot because:		
- not a member of the water group	☐	
- have not paid the fees	☐	
- other reason(s), specify	☐	
Excluded by others because:		
- social, cultural or religious reasons	☐	

W5 20. What changes would be needed for you to use the supply?
(This question applies to those not using the supply)

Indi-
cator

- W5 21. In what way would you suggest the water supply services could be improved?
(More information to and involvement of consumers, improvements in the system for revenue collection, improvements in maintenance, training to operators, removal of social barriers)

SANITATION

- S2 22. Have you built a latrine?

Yes ☐ , which type (if options)

No ☐ , continue to Question 27

- S2 23. When was it completed? _____ (month/year)

- S5 24. How many of the household use the latrine regularly?

Adults		Children ≤ 5 years		
M	F	M	F	

- S3,S4 25. Are there any problems with the latrine?

e.g. Flies and/or mosquitoes ☐

Smell ☐

Flooding in rainy season ☐

Difficulties for the younger children to use it ☐

Emptying (if applicable) ☐

Other ☐

Some probable categories,
actual categories to be
established through
pilot interviews

- S3,S4 26. How do you think the latrine could be improved?

- S1 27. Have you been informed about the support the Government is providing for latrine construction? (Applies to those without a latrine)

Yes ☐

No ☐

Indi-
cator

S2 28. If yes, have you considered participating in the programme?

Yes ☐ No ☐

S2 29. What is the reason(s) why you have not yet joined or why you do not wish to join?

The latrine is not needed ☐

The latrine is too expensive ☐

No time to build ☐

Do not know how to build ☐

Have tried but have been told
it is not yet my turn ☐

There are no squatting slabs left ☐

Other reason ☐

} Some possible categories,
actual categories to be
established through
pilot interviews.

ANNEX 2

GLOSSARY OF SELECTED TECHNICAL TERMS

Arithmetic Mean or Average: The sum of the values recorded in a series of observations divided by the number of observations.

Cluster Sampling: A cluster is a randomly selected group of households. All households in the area to be surveyed have an equal chance of being included in a cluster. Cluster sampling has the advantages of relative speed, low cost, and low personnel requirements.

Chlorination: the application of chlorine to drinking water for disinfection or oxidation of undesirable compounds.

Coliform Organism: Any of a number of organisms common to the intestinal tract of man and animals whose presence in water is an indication of pollution and of potentially dangerous bacterial contamination.

Confounding Variables: Variables other than the intervention that are associated with the indicator being measured (e.g. age, sex, socio-economic status, ethnic group).

Contamination: A general term signifying the introduction into water of micro-organisms, chemicals, wastes or sewage which renders the water unfit for its intended use.

Control or Comparison Group: Population that have not been subject to the intervention under evaluation. The control group should be matched for confounding variables.

Excreta: Liquid and solid waste products, human or animal.

Faeces: Solid human or animal excreta.

Faecal Coliform Bacteria: A group of organisms common to the intestinal tracts of man and of animals. The presence of faecal coliform bacteria in water is an indicator of pollution and of potentially dangerous bacterial contamination.

Groundwater: The supply of freshwater under the earth's surface in an aquifer or soil that forms the natural reservoir for man's use.

Heavy Metals: Metallic elements with high molecular weights, generally toxic in low concentrations to plant and animal life. Such metals are often residual in the environmental and exhibit biological accumulation. Examples include mercury, chromium, cadmium, arsenic and lead.

Incidence Rate: The number of illnesses beginning within a specified period of time related to the average number of persons exposed to risk during that period.

Night Soil: Human faeces and urine collected without dilution in large volumes of water.

Pathogen: Disease-causing organism.

Pit Latrine: A hole dug in the ground used for defecation, normally having a rudimentary superstructure and floor.

Pollution: The presence of matter whose nature, location or quantity produces undesired environmental effects.

Prevalence Rate: The number of illnesses existing at a specified point of time related to the number of persons exposed to risk at that point of time.

Residual chlorine: The amount of chlorine, free or combined, which remains after due time has been allowed for the reaction.

Sampling: Observations are made on a sample with the purpose of generalizing from them to the entire study population.

Sampling Frame: A list of population (could also be settlements or household depending on the unit of study) from which the sample is to be drawn.

Sanitation: The usual definition is very broad:

The control of all the factors in man's physical environment that exercise or can exercise a deleterious effect on his physical development, health and survival.

In this document the word sanitation is used in the narrow sense of "the control of human faeces and urine".

Silt: Finely divided particles of soil or rock. Often carried in cloudy suspension in water and eventually deposited as sediment.

Simple Random Sampling: Drawing a sample from a population by a random method, e.g. by the use of random sampling numbers, which gives every individual in the population an equal and independent chance of appearing in the sample.

Slow Sand Filter: A filter for the treatment of water, in which sand is used as the filter medium, and in which mechanical removal of solids is assisted by biological action.

Stratified Random Sample: Drawing a sample from a population which has first been divided into sub-groups or strata. From each sub-group a sample is drawn by a random method which gives every individual in the sub-group an equal and independent chance of appearing in the sample.

Turbidity: Cloudy condition in water due to the suspension of silt or finely divided organic matter.

Two-Stage Sampling: A process of sampling a population in a series of consecutive steps, e.g. after specific projects have been selected for evaluation, households to be surveyed within a project can be selected randomly using a list of households as sampling frame.

Vector: Disease vector - a carrier, usually an arthropod, that is capable of transmitting a pathogen from one organism to another.

Water Pollution: The addition of sewage, industrial wastes or other harmful or objectionable material to water in concentrations or in sufficient quantities to result in measurable degradation of water quality.

Water Seal: The seal provided by water, as in a U-trap normally located immediately below the toilet bowl.

Water Supply System: The system for the collection, treatment, storage and distribution of potable water from the sources of supply to the consumer.

Water Table: The upper level of ground water.

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