

COMMUNITY WATER SUPPLY AND SANITATION

PROCEEDINGS OF THE ADVISORY COMMITTEE MEETING OF THE OPERATION AND MAINTENANCE WORKING GROUP

GENEVA, 26 FEBRUARY - 1 MARCH 1991



WORLD HEALTH ORGANIZATION
DEUTSCHE GESELLSCHAFT FÜR TECHNISCHE ZUSAMMENARBEIT (GTZ)

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ACRONYMS

| | |
|----------------|--|
| ESA | External Support Agency |
| IWSA | International Water Supply Association |
| WHO | World Health Organization |
| UN | United Nations |
| GTZ | Deutsche Gesellschaft Fur Technische Zusammenarbeit |
| IRC | International Reference Centre - The Hague |
| UNDP | United Nations Development Programme |
| WASH | Water and Sanitation for Health Project |
| WB/UNDP | World Bank/United Nations Development Programme |

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Thanks must also be given to Mr. Fred Greiner who acted as chairman and to Dr. H. J. McPherson who acted as rapporteur. WHO also wishes to thank all the participants and their organizations whose attendance at the meeting made it a success.

This report was prepared by Dr. H. J. McPherson, University of Alberta, assisted by the members of the Advisory Committee.

PREFACE

In spite of repeated statements resulting from international meetings and a general recognition of the need to improve the operation and maintenance of existing and planned water supply and sanitation systems, progress in establishing viable and successful operation and maintenance programmes is discouragingly slow. It is estimated that more than 50 percent of the existing systems are not reliable, not sustainable or inefficient as a result of poor operation and maintenance both in the rural and urban areas.

As a result levels of service are lower than planned and access to reliable drinking water and waste disposal systems are not assured on a sustainable basis.

A concerted action is urgently required to improve operation and maintenance as quickly as possible. If such action is not taken, the benefits of existing water supply and sanitation systems will be progressively lost in spite of reported successes in extending coverage and creating more access to improved water and sanitation services in rural, urban and peri urban areas.

New investments do not seem justified if the operation and maintenance issue is not dealt with and if the sustainability of existing systems is not guaranteed before investing in and constructing new systems which in their turn will rapidly deteriorate.

If better operation and maintenance performance is not achieved, then increasingly investments will have to be directed to the rehabilitation of systems.

National governments and external support agencies have been partners in planning and implementing water supply and sanitation programmes. In a similar way, national governments and ESA's should form a partnership to retard the major losses in investment which are occurring as a result of inadequate operation and maintenance.

It must be emphasized that operation and maintenance should be addressed by national governments with the support of ESAs.

Projects planned and supported by ESA's must include adequate provisions for the implementation of programmes aimed at the operation and maintenance of new facilities at an earlier stage, and at the transfer of these responsibilities to the national governments in order to guarantee their long term sustainability.

1.0 INTRODUCTION

The operation and maintenance of water and sanitation systems has become an urgent priority for the sector. Systems are failing at an alarming rate and statistics indicate that up to 50 percent of facilities may not be operating at any one time. In some countries, even higher rates have been reported.

National governments and external support agencies are devoting increasing efforts to the rehabilitation of systems as a consequence of neglected operation and maintenance which is causing a severe drain on scarce resources.

In 1988, to focus attention on this issue, WHO assisted by IRC held a one day informal working session in the Hague with ESA representatives. A working group was established with the objective of improving the performance of operation and maintenance and held its first meeting in Geneva 16 -17 February 1989. This meeting was organized by WHO and a list of key issues were identified and a methodology for joint cooperation adopted.

A second meeting of this working group was held in Geneva from 19 - 22 June 1990 following a preplanning organizational meeting of sector professionals from GTZ, WASH, IRC, WHO and the World Bank/UNDP project in February 1990 in the Hague. The February 1990 meeting identified major constraints which influence the current situation of operation and maintenance in developing countries. It also:

- Described the effects of these issues on the effectiveness and efficiency of water and sanitation agencies;
- Defined the aims of the proposed coordination of efforts; and
- Discussed some of the key issues and activities to be jointly implemented.

The attendees from some 25 different countries, were water and sanitation sector specialists, involved in operation and maintenance in their respective countries. The objectives of the Geneva meeting were to seek ways and propose concrete initiatives to improve the operation and maintenance of water and sanitation supply facilities in the developing world.

The participants' tasks were to review the key issues and problems resulting in inadequate operation and maintenance, suggest possible solutions and propose activities for implementation by ESA's, national governments and others to enhance operation and maintenance activities.

The participants in Geneva identified the key issues constraining good operation and maintenance performance and suggested a series of activities which should be implemented to address these.

The key issues were identified as:

1. Inadequate Data on Operation and Maintenance
2. Insufficient and Inefficient Use of Funds
3. Poor Management of Water Supply Facilities
4. Inappropriate System Design
5. Low Profile of Operation and Maintenance
6. Inadequate Policies, Legal Frameworks and Overlapping Responsibilities
7. Political Interference

The working group in Geneva proposed that the following activities be implemented at global and national levels to improve operation and maintenance performance.

The activities were grouped under four main headings reflecting the priority issues identified:

- Policy formulation, collaboration and coordination;
- Enhance profile of operation and maintenance at global and national levels;
- Management improvement; and
- Data collection and operation and maintenance monitoring

To focus policy formulation and promote collaboration and coordination, the following specific actions were suggested:

1. A review of ESA sector policy documents should be undertaken and a set of policy guidelines established that adequately address the operation and maintenance issue;
2. A review of national government sector policies and practices on operation and maintenance should be carried out and national government policies and legal frameworks established. These should ensure that operation and maintenance concerns are included in the project design right from the projects' initiation;
3. Legislation should be enacted to restrict the discharge of pollutants and to restrict the use of materials that in addition to environmental problems would cause operation and maintenance difficulties; and
4. A forum should be established to encourage the collaboration and coordination of and national governments and ESA's at the country level in order to achieve common policies, unified approaches, compatible technologies and standardized equipment within the framework of national policies.

To enhance the profile of operation and maintenance the following were recommended:

1. Preparation of a global position paper on operation and maintenance directed at decision makers in national governments and ESA's to promote giving the highest priority in the sector to operation and maintenance at both international and national levels;

2. Promotion of an awareness raising campaign on operation and maintenance at national levels through workshops, seminars and conferences;
3. Hosting of workshops at a national level to promote the maximum exchange of information on specific aspects of operation and maintenance and to develop strategies to improve operation and maintenance performance;
4. Promotion of a higher profile for operation and maintenance to professional associations, training establishments and other organizations through guidelines, workshops, seminars and conferences; and
5. Preparation of guidelines for issue by ESA's to engineers responsible for the design of new systems in which the inclusion of operation and maintenance concerns in systems designs would be encouraged.

Management, it was proposed, could be improved by the following:

1. At the global level to promote viable autonomous agencies which range at one extreme from a community based rural through to urban utilities to manage water and sanitation systems on a fully self financing basis for operation and maintenance; and
2. To encourage ESA's and national governments to support the strengthening of agencies to enhance their ability to sustain adequate operation and maintenance activities.

The importance of data collection and monitoring was stressed, and the Geneva meeting recommended to:

1. Develop and implement monitoring systems for operation and maintenance costs and performance at the national level;
2. Implement programmes at the global and national government levels to systematically collect financial and performance data on operation and maintenance based on standard guidelines;
3. Develop international methodologies for the establishment of performance indicators and to review existing WHO guidelines on evaluation to determine if they properly reflect requirements for adequate operation and maintenance;
4. To institute at the global level a programme to accurately determine the costs of adequately operating and maintaining various types of water and sanitation systems; and
5. Studies should be initiated to determine the extent of cost saving and/or improvements to efficiency that will result from improved operation and maintenance and the use of locally or regionally manufactured spare parts. These studies could be funded possibly by ESA's and may necessitate the rehabilitation of facilities before improved operation and maintenance methods can be applied.

The working group suggested that ESA's should assist with these data collection and monitoring programmes and facilitate the exchange of cost and performance data, especially technology performance between countries. ESA's should also play a major role in ensuring feedback of information from the monitoring and evaluation of technologies to the system designers.

From February 26 to March 1, 1991, WHO with assistance from GTZ organized an Advisory Committee Meeting of the Operation and Maintenance Working Group in Geneva. The overall objective of the meeting was to continue the initiatives of the Geneva 1990 meeting and to develop a number of project proposals for implementation.

The project proposals were to include estimates of the levels of funding needed, the duration of the proposed project and if possible, an implementation strategy.

Further specific objectives were:

- The formulation of terms of reference for the implementation of the activities;
- The definition of implementing strategies for the activities; and
- The development of a working plan involving water agencies in Member States, the Advisory Committee, the Working Group and External Support Agencies.

This report contains a description of the project proposals developed by the Advisory Committee together with the major recommendations of the meeting.

2.0 PROJECT PROPOSALS

The Geneva Working Group Meeting in 1990, recommended a comprehensive set of activities to be undertaken to address operation and maintenance concerns on the three broad areas of sector performance, institutional performance and technology performance and environmental linkages.

The Advisory Committee recognized that developing projects to implement all of these activities was not immediately feasible. Therefore, the committee focused its efforts on developing a limited number of proposals which would address the priority activities. The criteria for selecting project activities were that:

- The amount of funds required for any one project were reasonable;
- The project could be implemented quickly, generally less than one year to enable an immediate impact on Operation and Maintenance performance; and
- Projects were selected which were generally global in scope and would be of use to the maximum number of ESA's and national governments.

Five priority project proposals were developed. These included:

1. Preparation of a global position paper on operation and maintenance;
2. Assessment of operation and maintenance status of water supply and sanitation systems;
3. Assessment of needs and resources, for training and human resources development in operation and maintenance;
4. Development of implementation strategies for operation and maintenance in rural and urban water supply programmes; and
5. Development of guidelines for improving operation and maintenance in the water supply and sanitation sector

The proposal for Project 5 is a comprehensive package of proposals for guidelines in the design and management of operation and maintenance in rural and urban water supply and sanitation. Ideally, the complete set of guidelines should be undertaken as part of one project. However, each of the eight guidelines making up the package could form a separate sub project if that were found to be more appropriate. Details on the eight sub proposals in the package are presented in Appendix I.

2.1 Preparation of Global Position - Paper on operation and maintenance.

2.1.1 Background and Project Objectives

The urgent need for an improvement in operation and maintenance performance has not received the recognition it deserves, especially by national governments. The emphasis in developing countries has usually been on new construction and the expansion of services which is politically attractive, while the operation and maintenance of existing systems has been accorded a much lower priority. Most external support agencies now realize the importance of Operation and Maintenance but are still influenced by requests from developing country governments to increase coverage. For ESA's it is also politically advantageous to stress expanded coverage.

Many decision makers in national governments and ESA's do not fully understand the major benefits to be obtained from good operation and maintenance performance or the substantial costs of inadequate operation and maintenance.

The objectives of this project are to inform and sensitize decision makers in the sector as to the urgent need for operation and maintenance and to make them aware of the very real financial, social and political benefits which will result from an improvement in operation and maintenance.

2.1.2 Description and Scope of Project

The project will prepare a global position paper on operation and maintenance for dissemination to decision makers in national governments and ESA's, and will also develop a series of eye catching and arresting posters which will emphasize and draw attention to the need for operation and maintenance.

2.1.3 Duration

It is estimated that the project will take six months to carry out. The proposed starting date should be as soon as possible.

2.1.4 Estimated Costs

| | |
|-------------------------------------|----------------------------|
| Consultant for 100 days | \$40,000.00 |
| Consultant Travel | 10,000.00 |
| Publication, 2000 copies in English | 10,000.00 |
| Review Meeting | 10,000.00 |
| Miscellaneous Costs | 5,000.00 |
| Poster Preparation | <u>25,000.00</u> |
| Total | <u>\$100,000.00</u> |

2.1.5 Project Outputs

Two major outputs are anticipated from the project. The first is a succinct comprehensive paper which describes and discusses the major issues in operation and maintenance, and emphasizes the very significant financial, social and political benefits to be gained from good operation and maintenance performance.

The second is a series of posters focusing attention on operation and maintenance which will be distributed widely throughout the developing world and to external support agencies.

2.2 Assessment of Operation and Maintenance Status of Water Supply and Sanitation Systems

2.2.1 Background and Project Objectives

Information on the status of operation and maintenance in both urban and rural areas is not adequate. Attempts have been made to review operation and maintenance in several areas of the world but the quality and quantity of available information do not cope with requirements for a comprehensive assessment of the current situation.

A main cause of this situation is that local planners and managers do not have the tools and methodology to collect the information in a systematic way.

The objective of the project is to provide sector professionals with a methodology and tools to generate reliable information to be used for:

- The assessment of operation and maintenance status on different levels;
- The identification of constraints and needs;
- The planning of operation and maintenance programmes; and
- The monitoring of progress made in programmes aiming at the improvement of operation and maintenance.

2.2.2 Description and Scope of Project

The project responds to the urgent need for accurate and reliable information:

- To define needs and constraints which prevent adequate operation and maintenance;
- To plan programmes and projects which give high priority to operation and maintenance; and
- To monitor progress and manage programmes aiming at improving the operation and maintenance performance.

In a first stage, the project will address the specific problems of operation and maintenance of water supply systems in order to develop tools and methods to be used at the project level, at the country level, and at the regional level focusing on point source systems, small fixed systems and large supply systems.

The major project components are:

1. A preliminary desk study, which reviews different approaches to operation and maintenance management (community, decentralized, agency managed), and which identifies standards for operation and maintenance performance.
2. The development of indicators and parameters as tools for operation and maintenance assessment and elaboration of checklists and questionnaires allowing a rapid comparative analysis, and the definition of constraints and needs.
3. The testing and the consolidation of the assessment procedure applied to a limited number of case studies; the sample case studies would be representative of different continents. A field investigation of operation and maintenance in the selected countries/projects will be involved.
4. The application of the operation and maintenance assessment procedure to a limited number of regions, chosen because of their great needs and the high level of investment in water supply facilities.

2.2.3 Duration

As outlined in the description and scope of the project, project components 1 and 2 will require a year; component 3, one half year and component 4, one year. The project should start as soon as possible.

2.2.4 Estimated Costs

| | |
|---------------------------|----------------------------|
| Project Component 1 and 2 | \$ 85,000.00 |
| Project Component 3 | 55,000.00 |
| Project Component 4 | <u>185,000.00</u> |
| Total | <u>\$325,000.00</u> |

2.2.5 Project Outputs

The methodology and tools generated by the project will allow sector professionals in developing countries to undertake a self assessment of their operation and maintenance status in the water supply and sanitation sector.

Specific project outputs will include:

- A general set of guidelines for sector professionals to assess operation and maintenance at the regional, national and project level;
- A set of annotated checklists for quickly assessing operation and maintenance status;
- A set of parameters and target figures for operation and maintenance evaluations; and
- A number of case studies describing the use and testing of the tools developed.

2.3 Assessment of Needs and Resources for Training and Human Resources Development in Operation and Maintenance

2.3.1 Background and Project Objectives

The management of water systems has been identified as a major weakness. Water utility companies and water agencies lack adequately trained staff with the necessary skills, expertise, technical, financial and managerial to efficiently operate and maintain the water facilities. Without well trained staff who can identify problems and maintain the responsible agencies on a sound financial basis, the systems will quickly deteriorate.

There are many institutions in both the developing world and the developed which provide training in water and sanitation. The courses vary in length and some are orientated to specific problems such as technology issues or financial management. In addition there has been a trend to develop courses to match a particular situation and to give these in developing countries.

Unfortunately, the existence of many of these training resources are not widely known or publicized. Agencies or projects looking for training in a specific topic may not be aware of what is available.

The goals of this project are to undertake, at the global level an assessment of the human resources development needs for operation and maintenance, and to identify the resources available.

2.3.2 Description of Project

The project would review and identify the different types of training and human resources development needs of agencies operating and maintaining rural and urban water supply and sanitation facilities. The project would for example analyze and prioritize the needs for financial, engineering, management, technical and support staff training and suggest ways and programmes by which these training and human resource development needs might be met.

The project would also review the training facilities, resources and programmes in existence in various countries and available through external support agencies either multilateral, bilateral or non governmental. It would also identify training gaps which would be tackled by the Operation and Maintenance Working Group at a later stage.

2.3.3 Duration

The project would take up to nine months to complete and should be started as soon as possible.

2.3.4 Estimated Costs

| | |
|---|---------------------------|
| One Consultant - 100 days | \$40,000.00 |
| Consultant Travel | \$20,000.00 |
| Publishing of Materials | \$25,000.00 |
| Review Meeting, Miscellaneous, Communication, Etc. | <u>5,000.00</u> |
| Total | <u>\$90,000.00</u> |

2.3.5 Project Outputs

The principal output of the project would be a document detailing the specific training needs for operation and maintenance.

A list would be prepared of the major training institutions and programmes which have been particularly successful. The individual programmes would be described and information would be included on how best to contact the institution or training facility.

This listing of programmes would be published in the form of a ready reference guide for use by ESA's, national governments and others working in the sector.

2.4 Development of Implementation Strategies for Operation and Maintenance in Rural and Urban Water Supply Programmes

2.4.1 Background and Project Objectives

Many projects being implemented and/or supported by external support agencies include as a component, the aim of improving operation and maintenance. Usually the strategy to achieve this is not rigidly detailed at the outset of the project but evolves during project implementation.

The objective of this project is to select a number of ongoing projects and to develop, experiment with and monitor strategies to improve operation and maintenance. These in effect would be case studies.

2.4.2 Description and Scope of the Project

A number of projects would be chosen for study. These would be selected after discussions with interested ESA's and national governments. An operation and maintenance specialist would assist in the development, implementation, monitoring and evaluation of the operation and maintenance approaches adopted.

Each year a meeting would be held of the project managers and the consultant specialist(s) for all of the projects selected as case studies, to review and discuss their experience with operation and maintenance. On the basis of these meetings, approaches and strategies would be redefined and refocussed.

2.4.3 Duration

Initially the project would be for five years and should start as soon as possible.

2.4.4 Estimated Costs

| | |
|-----------------------------|----------------------------|
| Consultants | \$60,000.00 |
| Consultant Travel | 30,000.00 |
| Publication | 10,000.00 |
| Annual Review Meeting Costs | 10,000.00 |
| Miscellaneous | <u>5,000.00</u> |
| Total | <u>\$115,000.00</u> |

2.4.5 Project Output

Each year at the conclusion of the annual review meeting, a document would be published describing the ongoing experiences in developing and implementing operation and maintenance strategies.

At the end of the project, a comprehensive review of the experiences in operation and maintenance would be prepared together with descriptions of the most successful and workable strategies.

2.5 Development of Guidelines for Improving Operation and Maintenance in the Water Supply and Sanitation Sector

2.5.1 Background and Project Objectives

Management and design of the operation and maintenance of water and sanitation systems continues to be an issue of major proportions in the sector. Coverage figures which indicate the numbers of people served by water supply and sanitation are often overly optimistic because of the reality that many of the systems are broken or operating at less than design capacity. At the root of these problems, in most cases, are engineering designs and management systems that have failed to provide the necessary guidance for operation and maintenance.

In order to provide the needed guidance, a series of reports are required which address each of eight major issues in water supply and sanitation. These issues are:

- Design of Urban Water Supply Systems;
- Design of Rural Water Supply Systems;
- Management of Urban Water Supply Systems;
- Management of Rural Water Supply Systems;
- Design of Urban Sanitation Systems;
- Design of Rural Sanitation Systems;
- Management of Urban Sanitation Systems; and
- Management of Rural Sanitation Systems;

The objectives of the project would be to prepare guidelines to assist professionals dealing with each of the eight issues. The design reports would be addressed primarily to the design engineers and focus on technical issues while the management reports will be oriented to planners and managers of systems.

It is expected that the eight issues would be treated as an integrated series of eight reports which would cover most of the topics related to operation and maintenance.

Detailed project proposals have been developed for each issue and are presented in Appendix I.

2.5.2 Description and Scope of Project

The project would prepare guidelines on the design and management criteria for operation and maintenance in rural and urban water supply and sanitation systems.

2.5.3 Duration

The project would be for one year and should start as soon as possible.

2.5.4 Estimated Costs

| | |
|--|----------------------------|
| Design of Urban Water Systems | \$50,000.00 |
| Design of Rural Water Systems | 30,000.00 |
| Management of Urban Water Systems | 50,000.00 |
| Management of Rural Water Systems | 50,000.00 |
| Design of Urban Sanitation Systems | 30,000.00 |
| Design of Rural Sanitation Systems | 30,000.00 |
| Management of Urban Sanitation Systems | 30,000.00 |
| Management of Rural Sanitation Systems | <u>30,000.00</u> |
| Total | <u>\$300,000.00</u> |

2.5.5 Project Output

A series of guidelines, one for each of the eight subsectors which would address the issues for operation and maintenance in the subsector. The guidelines would be concise and succinct and be in range of 30 to 50 pages.

3.0 RECOMMENDATIONS

The advisory committee made the following recommendations:

1. That WHO should remain the focal institution to promote, coordinate and act as a forum for operation and maintenance concerns.
2. That attempts should be made as quickly as possible to obtain funding to implement the priority projects identified.
3. That renewed efforts should be focused on promoting a concern for operation and maintenance with national governments and external support agencies. This will include:
 - An effort to have Operation and Maintenance given priority in the sector papers of external support agencies; and
 - Promotion of the need for Operation and Maintenance by attendance at and presentation of papers at major international meetings such as the Collaborative Council meeting in Norway, the International Water Supply Association meeting in Copenhagen and other important conferences.

APPENDIX I

1.0 GUIDELINES FOR CONSIDERATION OF OPERATION AND MAINTENANCE CRITERIA IN DESIGN OF URBAN WATER SUPPLY SYSTEMS IN DEVELOPING COUNTRIES

1.1 Background and Project Objectives

Design of urban water systems continues to be an issue of major proportions in the sector. Coverage figures which indicate the numbers of people served by water supply are often overly optimistic because of the reality that many of the systems are broken or operating at less than design capacity. At the root of these problems, in most cases, are engineering designs that have failed to provide the necessary guidance for operation and maintenance.

It is necessary to incorporate into the designs for new works, expansion or rehabilitation, those aspects that assure proper operation and maintenance, taking into account such concerns as technology choice, spare parts availability, local manufacture, local ability to operate and maintain the systems and training needs. Design criteria must emphasize facilitation for operational control, unaccounted for water programmes, metering systems and maintenance of both pipes and facilities.

The objective of this project is to develop a set of guidelines describing the design criteria for an urban water supply system.

1.2 Description and Scope of Project

The following items will be considered in developing the guidelines:

1. SOURCE

Site selection

Assure flexibility

Protection

2. TREATMENT

Appropriate technology

Level of treatment

Operational alternatives

Energy sources

Flexibility

Disaster consideration

3. TRANSMISSION

- Bulk meters
- Valves (air, check, gate, etc.)
- Pipe material
- (Accessibility, worker safety)

4. STORAGE

- Adequacy and reliability
- Operational flexibility (by passes, etc.)

5. VALVES

- Valves (choice, location)
- Network plan conducive for isolating section (leakage control)
- Bulk meters
- Hydrants
- Pipe selection
- Wash outlets
- Right of way (w/other utilities)

6. USER CONNECTIONS AND PUBLIC STANDPOSTS

- Materials
- Valves and chambers
- Standardized location
- Standardized meters

7. MISCELLANEOUS

- Operational control (data on flows, pressures and volumes of reservoirs)
- Design criteria (life of materials, demand projection)
- Metering policy (service connection)
- Water Quality Control

1.3 Duration

| | |
|---------------|------------------|
| Draft | 5 months |
| Review | 3 months |
| Final Editing | 2 months |
| Publishing | <u>2 months</u> |
| Total | 12 months |

1.4 Estimated Costs

| | |
|-------------------------------|---------------------------|
| Labour | \$35,000.00 |
| Publication and miscellaneous | <u>15,000.00</u> |
| Total | <u>\$50,000.00</u> |

1.5 Project Output

Improvements in operation and maintenance performance.

2.0 GUIDELINES FOR CONSIDERATION OF OPERATION AND MAINTENANCE IN DESIGN OF RURAL WATER SUPPLY SYSTEMS IN DEVELOPING COUNTRIES

2.1 Background and Project Objectives

Design of rural water systems continues to be an issue of major proportions in the sector. Coverage figures which indicate the numbers of people served by water supply are often overly optimistic because of the reality that many of the systems are broken or operating at less than design capacity. At the root of these problems, in most cases, are engineering designs that have failed to provide the necessary guidance for operation and maintenance.

It is necessary to incorporate into the designs for new works, expansion or rehabilitation, those aspects that assure proper operation and maintenance, taking into account concerns as technology choice, spare parts availability, local manufacture, local ability to operate and maintain the systems and training needs. Design criteria must emphasize facilitation for operational control, unaccounted for water programmes, metering systems and maintenance of both pipes and facilities.

2.2 Description and Scope of Project

The project will produce a short concise set of guidelines detailing the design issues for rural water supplies. The following items will be considered:

1. **SOURCE**
 - Site selection
 - Assure flexibility
 - Protection
2. **TREATMENT**
 - Appropriate technology
 - Level of treatment
 - Operational alternatives
 - Energy sources
 - Flexibility
 - Disaster consideration
3. **TRANSMISSION**
 - Valves (air, check, gate, etc.)
 - Pipe material
 - Accessibility (worker safety)

4. STORAGE

Operational flexibility (by passes, etc.)

5. VALVES

Valves (choice, location)

Network plan conducive for isolating section (leakage control)

Bulk meters

2.3 Duration

| | |
|---------------|------------------|
| Draft | 4 months |
| Review | 2 months |
| Final editing | 2 months |
| Publishing | <u>2 months</u> |
| Total | 10 months |

2.4 Estimated Costs

| | |
|------------------------|---------------------------|
| Labour, Report Writing | \$20,000.00 |
| Publication | 3,000.00 |
| Miscellaneous | 3,000.00 |
| Editing | 2,000.00 |
| Review | <u>2,000.00</u> |
| Total | <u>\$30,000.00</u> |

2.5 Project Output

Improvement in operation and maintenance, increased revenue and/or reduced operational costs due to reduced water losses and breakages.

3.0 GUIDELINES FOR CONSIDERATION OF OPERATION AND MAINTENANCE CRITERIA IN MANAGEMENT OF URBAN WATER SUPPLY SYSTEMS IN DEVELOPING COUNTRIES

3.1 Background and Objective

Management of the operation and maintenance of urban water supply systems continues to be an issue of major proportions in the sector. Coverage figures which indicate the numbers of people served by water supply are often overly optimistic because of the reality that many of the systems are broken or operating at less than design capacity. At the root of these problems, in most cases, are management systems that have failed to provide the necessary guidance for operation and maintenance.

Despite some aspects such as level of organization and technology, the continuous monitoring and evaluation for operation and maintenance is a task to be faced in order to obtain the proper information on decisions to be made or the actions to be taken for ensuring proper operation and maintenance, and an adequate level of service that meets the standards for which the system was designed.

Low figures for unaccounted for water, reasonably short stoppage times for electro-mechanical components, high standards for water quality, and a short time for repairs, are aspects that managers must be looking at, so as to improve efficiency. In addition, a continuous monitoring of the costs involved in all the operation and maintenance activities, must be undertaken in order to define a reasonable rate that covers all these costs.

The objective of this project is to produce a short concise set of guidelines for the management of urban water systems.

3.2 Description and Scope of Project

The following factors will be considered in developing the guidelines:

- Centralized vs. decentralized
- Level of economic development
- National institutions (government agencies)
- Local institutions (municipality)
- Private sector
- Service levels and coverage
- Choice of source - groundwater and surface water
- Adequate technology
- Availability of spare parts and materials

- Standardization
- Skilled manpower
- Local manufacture and materials
- Sector policy
- Population distribution
- Water rights
- Willingness and ability to pay
- Tariff base values and structure
- Valuation and depreciation
- External agencies (NCO's, etc.)
- Unaccounted for water
- Monitoring and evaluation (operation and maintenance, inventory, finances, etc.)
- Source of funding (central budget or independent sources)
- Organization structure
- Public relations
- Human resources development and training

3.3 Duration

One year. Project should be started as soon as possible.

3.4 Estimated Costs

| | |
|----------------|---------------------------|
| Report Writing | \$25,000.00 |
| Review | 5,000.00 |
| Editing | 5,000.00 |
| Publication | 5,000.00 |
| Miscellaneous | <u>10,000.00</u> |
| Total | <u>\$50,000.00</u> |

3.5 Project Output

A set of guidelines for the better operation and maintenance of urban water supply systems.

4.0 GUIDELINES FOR CONSIDERATION OF OPERATION AND MAINTENANCE OF RURAL WATER SUPPLY SYSTEMS IN DEVELOPING COUNTRIES.

4.1 Background and Project Objectives

Management of the operation and maintenance of rural water and sanitation systems continues to be an issue of major proportions in the sector. Coverage figures which indicate the numbers of people served by water supply are often overly optimistic because of the reality that many of the systems are broken or operating at less than design capacity. At the root of these problems, in most cases, are management systems that have failed to provide the necessary guidance for Operation and Maintenance.

Management systems that are typically applied to rural water supply facilities range from highly centralized ones where government organizations undertake more of the responsibility to community organizations who own and operate their own facilities. In between, there are examples of shared responsibility which include not only the government organizations and the communities, but may also include private entrepreneurs.

Often these models are referred to according to the number of tiers involved. The first tier refers to the government agency responsible for Operation & Maintenance at the national level. The second tier represents an intermediate body, either a regional organization, or a private group that has regional responsibilities. The third tier is composed of communities which are responsible for their own system. The relative importance accorded to each of these tiers essentially defines the model although there are a variety of mixes which produce what may be called hybrid models.

It is clear that in some countries, a particular model may work quite well, while in others the same model meets with failure. Guidelines on selecting the optimum model for a particular situation are needed which take into account a variety of factors which affect Operation & Maintenance. The purpose of this project is to produce a short concise set of guidelines for the management of rural water supply systems.

4.2 Description and Scope of Project.

In preparing the guidelines the following factors will be considered:

- Centralized vs. decentralized
- Level of economic development
- National institutions (Government Agencies)
- Private sector
- Service levels and coverage

- Choice of source - groundwater and surface water
- Pumping technologies (hand, electricity, fuel, solar, wind)
- Availability of spare parts and materials
- Standardization
- Skilled manpower
- Role of women
- Local manufacture and materials
- Sector policy
- Cost recovery and valuation of assets
- Population distribution
- Water rights
- External agencies (NGOs, etc.)
- Willingness and ability to pay

4.3 Duration of Project. WASH is presently preparing this set of guidelines which will be completed in July 1991.

5.0 GUIDELINES FOR CONSIDERATION OF OPERATION AND MAINTENANCE CRITERIA IN DESIGN OF URBAN SANITATION SYSTEMS IN DEVELOPING COUNTRIES.

5.1 Background and Project Objectives

Design of urban sanitation systems continues to be an issue of major proportions in the sector. Coverage figures which indicate the numbers of people served by sanitation systems are not only low but the reality is that many of the systems are broken down or operating at less than design capacity are actually lower. At the root of these problems, in most cases, are engineering designs that have failed to provide the necessary guidance for Operation & Maintenance.

It is necessary to incorporate into the designs for new works, expansion or rehabilitation, those aspects that ensure proper Operation & Maintenance, taking into account concerns such as technology choice, use of local materials, local ability to operate and maintain the systems and training needs. Design criteria must emphasize facilitation for operational control and maintenance of facilities.

5.2 Description and Scope of Project

The purpose of this project is to produce short, concise guidelines (not more than 30 pages). The following items will be considered:

1. COLLECTION

- Pump
- Pipe
- Manual
- Mechanical (vacuum trucks)
- Storage

2. TRANSMISSION

- Pumping station
- Pipeline
- Manholes (cleaning equipment - pressure tankers and rodders)
- Flow equalization tanks (sand traps)

3. TREATMENT

- Choice of appropriate treatment
 - [Lagoons
 - [Stabilization ponds
 - [Oxidation ditches
 - [Trickling filters, etc.
- Levels of treatment
- Operational alternatives

Energy sources

Flexibility

4. DISPOSAL

Reuse of water and sludge

Effect on environment (receiving waters)

5. MISCELLANEOUS

Disaster preparedness

5.3 Duration

One year with project to start as soon as possible.

5.4 Cost Estimates

| | |
|----------------|-----------------|
| Report Writing | \$20,000 U.S. |
| Review | \$ 2,000 |
| Editing | \$ 2,000 |
| Publication | \$ 3,000 |
| Miscellaneous | <u>\$ 3,000</u> |
| Total | \$30,000 |

5.5 Project Outputs

Improvement in operation and maintenance of urban sanitation systems through the use of the design guidelines.

6.0 GUIDELINES FOR CONSIDERATION OF OPERATION & MAINTENANCE OF RURAL SANITATION SYSTEMS IN DEVELOPING COUNTRIES.

6.1 Background and Project Objectives

Design of rural sanitation systems continues to be an issue of major proportions in the sector. Coverage figures which indicate the numbers of people served by sanitation systems are not only low but the reality is that many of the systems are operating at less than design capacity. At the root of these problems, in most cases, are engineering designs that have failed to provide the necessary guidance for Operation & Maintenance.

It is necessary to incorporate into the designs for new works, expansion or rehabilitation, those aspects that ensure proper Operation & Maintenance, taking into account concerns as such technology choice, use of local materials, local ability to operate and maintain the systems and training needs.

The objective of this project is to prepare a comprehensive set of guidelines which discuss the criteria to be included in the design of rural sanitation systems in order to ensure their sustainability.

6.2 Description and Scope of Project

The following items will be considered in preparing the guidelines.

1. COLLECTION
 - Septic tanks
 - Latrines (VIPs, etc)
 - Low diameter piping
2. TRANSMISSION
 - Vacuum trucks
 - Manual
 - Piping
3. TREATMENT
 - On site holding
 - Night soil sand beds
 - Lagoons, etc.
4. WASTE REUSE
 - Fertilizers
 - Fuel

6.3 Duration

One year. Project to start as soon as possible.

6.4 Estimated Costs

| | |
|----------------|-----------------|
| Report Writing | \$20,000 U.S. |
| Review | \$ 2,000 |
| Editing | \$ 2,000 |
| Publication | \$ 3,000 |
| Miscellaneous | <u>\$ 3,000</u> |
| Total | \$30,000 |

6.5 Project Output

An improvement in the operation and maintenance of rural sanitation systems.

7.0 GUIDELINES FOR CONSIDERATION OF OPERATION & MAINTENANCE CRITERIA IN MANAGEMENT OF URBAN SANITATION SYSTEMS IN DEVELOPING COUNTRIES.

7.1 Background and Objectives

Management of the operation and maintenance of urban sanitation systems continues to be an issue of major proportions in the sector. Coverage figures which indicate the numbers of people served by sanitation are often overly optimistic because of the reality that many of the systems are broken or operating at less than design capacity. At the root of these problems, in most cases, are management aspects that have failed to provide the necessary guidance for Operation & Maintenance.

The purpose of this project is to produce a short concise set of guidelines which describe the operation and maintenance criteria in the management of urban sanitation systems in the developing world.

7.2 Description and Scope of Project

- Centralized v. decentralized
- Level of economic development
- National institutions (Government Agencies)
- Private sector
- Service levels and coverage (individual, Communal)
- Choice of technologies (Latrine, septic tanks, low cost piped systems, lagoons, stabilization ponds)
- Availability of spare parts and materials
- Standardization
- Skilled manpower
- Local manufacture and materials
- Sector policy
- Cost recovery and valuation of assets
- Population control of receiving water bodies, groundwater
- External agencies (NGOs, etc.)
- Willingness and ability to pay
- Night soil collection and disposal and treatment
- Hygiene education

7.3 Duration of Project

One year to start as soon as possible.

7.4 Cost Estimates

| | |
|----------------|-----------------|
| Report Writing | \$20,000 U.S. |
| Review | \$ 2,000 |
| Editing | \$ 2,000 |
| Publication | \$ 3,000 |
| Miscellaneous | <u>\$ 3,000</u> |
| Total | \$30,000 |

7.5 Project Output

An improvement in the operation and maintenance of urban sanitation systems.

8.0 GUIDELINES FOR CONSIDERATION OF OPERATION & MAINTENANCE CRITERIA IN MANAGEMENT OF URBAN SANITATION SYSTEMS IN DEVELOPING COUNTRIES.

8.1 Background and Project Objectives

Management of the operation and maintenance of urban sanitation systems continues to be an issue of major proportions in the sector. Coverage figures which indicate the numbers of people served by sanitation are often overly optimistic because of the reality that many of the systems are broken or operating at less than design capacity. At the root of these problems, in most cases, are management aspects that have failed to provide the necessary guidance for Operation & Maintenance.

It is clear that in some countries, a particular Operation & Maintenance model may work quite well, while in others the same model meets with failure. Guidelines on selecting the optimum model for a particular situation are needed which take into account a variety of factors which affect Operation & Maintenance. The purpose of this project is to produce a short concise set of guidelines to assist in the management of rural sanitation systems.

8.2 Description and Scope of Project

The following factors will be considered in preparing the guidelines.

- Centralized v. decentralized
- Level of economic development
- National institutions (Government Agencies)
- Private sector
- Service levels and coverage (individual, communal)
- Choice of technologies (Latrine, septic tanks, low cost piped systems, lagoons, stabilization ponds)
- Standardization
- Role of Women
- Skilled manpower
- Local manufacture and materials
- Sector policy
- Cost recovery
- Population distribution
- Pollution control of receiving water ?, groundwater
- External agencies (NGOs, etc.)
- Willingness and ability to pay

- Night soil collection and disposal and treatment
- Hygiene education

8.3 Duration of Project

Ten months to start as soon as possible.

8.4 Cost Estimate

| | |
|----------------|-----------------|
| Report Writing | \$20,000 U.S. |
| Review | \$ 2,000 |
| Editing | \$ 2,000 |
| Publication | \$ 3,000 |
| Miscellaneous | <u>\$ 3,000</u> |
| Total | \$30,000 |

8.5 Project Outputs

An improvement in operation and maintenance of rural sanitation systems.

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For further information, write to:
The Manager
Community Water Supply and
Sanitation, EHE/CWS
World Health Organization
1211 Geneva, Switzerland