

COMMUNITY WATER SUPPLY
AND SANITATION

**PROCEEDINGS OF THE MEETING OF
THE OPERATION AND MAINTENANCE
WORKING GROUP
Geneva, 19 - 22 June 1990
VOLUME 1: REPORT OF THE MEETING**

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**IRC, INTERNATIONAL WATER AND SANITATION CENTRE, Netherlands
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WORLD HEALTH ORGANIZATION

DEUTSCHE GESELLSCHAFT FÜR TECHNISCHE ZUSAMMENARBEIT (GTZ)



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**MEETING OF THE WORKING GROUP ON
OPERATION AND MAINTENANCE**

Geneva, June 19-22, 1990

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Acronyms

ESA	External Support Agency
WHO	World Health Organization
UN	United Nations
GTZ	Deutsche Gesellschaft für 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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PREFACE

Towards a New Philosophy on Operation and Maintenance

The operations and maintenance of water supplies and sanitation in developing countries is badly neglected, so much so that many schemes have fallen into disrepair and no longer provide the services for which they were constructed. Because of this the actual coverage levels of adequate water and sanitation in developing countries is even lower than statistics would suggest. Furthermore, this low level of service has become accepted as the norm in many places. The deterioration of these valuable physical assets is a major loss to national economies which should be avoided and although most external support agencies do not fund operations and maintenance, rehabilitation projects have become an increasing part of many country support programs. Rehabilitation is the extreme form of operations and maintenance which would not have been required, or would have been postponed if regular maintenance had taken place.

This situation has come about for a number of reasons. Among them is the emphasis by developing country governments and external support agencies on trying to quickly make up the large sector deficit by providing services to those without adequate facilities, and hence the emphasis on capital construction and expansion particularly of water services. Another is the previous long standing tradition of some governments and external support agencies to consider water and sanitation as being a free social service for all, the costs of which are not borne by the user.

In order to rectify this situation and improve operations and maintenance a number of fundamental changes must take place in the agencies responsible for providing these services. First, water and sanitation agencies should change their orientation and begin to perceive of their primary role as the provider of a service to people and not the constructor of physical works. Second, the agencies themselves, which could range from a public utility to a community group, should become autonomous in efficient management and financing of the services. Third, these agencies should provide integrated water and sanitation services only in response to the effective demand of the consumer. That is, the level

of services for which the consumer is willing to pay for in order to ensure good public health and environmental standards for the community.

In order to ensure the long term sustainability of water and sanitation services an awareness should be created which recognizes that maintenance is an essential component of successful development and resource utilization. Furthermore, the above principles should be embodied in the projects, policies and practices of the agencies responsible for providing water and sanitation, and the external support agencies who assist them.

1.0 INTRODUCTION

The operation and maintenance of water supply and sanitation systems is a complex issue with linkages and interrelationships to water resources, environmental sanitation (solid and liquid waste management) and the environment in general. Operation and maintenance cannot be discussed in isolation or by ignoring these interlinkages. The relationships between water supply, waste and water resources are illustrated in Figure I.

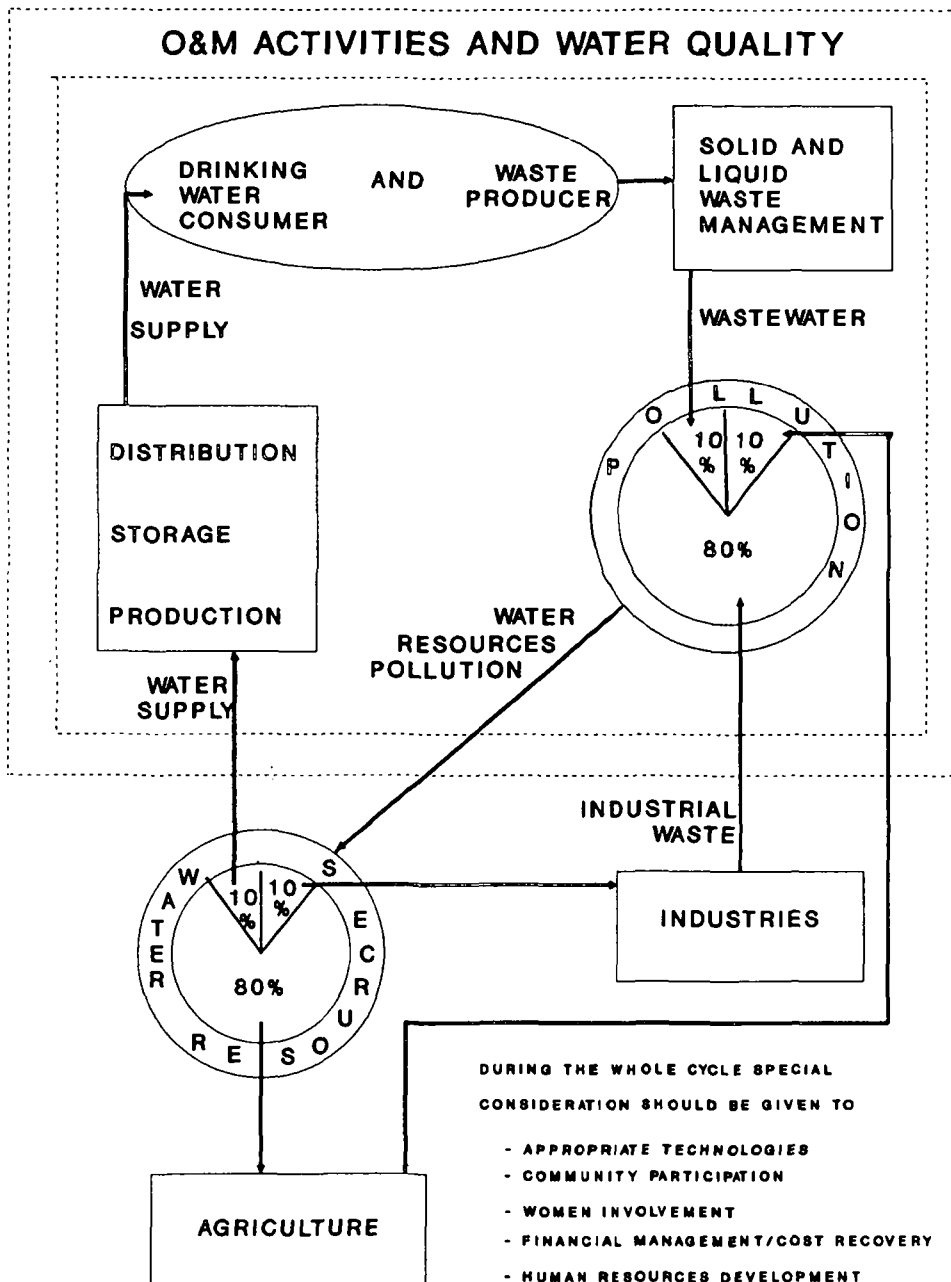


FIGURE I

The operation and maintenance of a water supply system affects and in turn is affected by the water resources which are the basis of supply. Raw water quality influences treatment requirements, available quantity determines amounts which can be provided to users and which need to be disposed of after use. Because most urban domestic water use is non consumptive (except where lawns are watered), the more water is supplied, the more polluted water is being discharged, leading to the contamination of water sources of the community in question or, more likely, of other communities. Conversely, lack of sufficient water makes the operation of a waterborne human waste disposal system impossible.

In the absence of sewage disposal systems, the local environment is being contaminated in direct relation to the amount of drinking water supplied, potentially causing more health problems than presumed resolved with the supply of water. Inadequate drainage and solid waste collection practices aggravate wastewater disposal problems in the absence of sewer systems. As the quantity of potable water supplied increases, this is true even for on site systems because the quantity of sullage water increases to the point that on-site soil absorption capacity is exceeded and excess wastewater flows to public streets and drains.

Operation and maintenance suffers if the issues described are not resolved at the design stage and if there is insufficient coordination and cooperation between the various agencies with responsibilities in water resources and for the environment.

Fortunately, the relationships between water supply water resources and the environment are increasingly being recognized. The activities of agriculture, forestry and industry are important. Both agriculture and industry require water and are often the major users. They return the unconsumed water to the environment often in a very polluted state containing a range of industrial and agricultural chemical contaminants. This pollution of water resources in the developing world by agriculture and industry is well documented and in many developing countries has reached alarming proportions. To combat these harmful pollutants water supply systems must install sophisticated treatment methods which are costly to operate and maintain and require advanced technical skills.

Uncontrolled timber cutting has an unenviable record of causing accelerated erosion and dramatic increases in the sediment loads of streams. This increase in sediment poses problems to the operation and maintenance of water supply systems because the sediment must be removed to prevent damage of water equipment. If it is not, the lifetimes of the equipment are much reduced and operation and maintenance becomes more costly.

Projects in the water supply and sanitation sector of developing countries have traditionally received strong support from donor organizations. Needs have been so great and of such a varied nature that national governments have had little difficulty in identifying project packages in accordance with the development wishes of the different types of external support agencies. Thus commercial loans have been attracted for large scale "bankable" projects, mainly in the urban water supply and sanitation subsector, soft loans and grants have been made available from bilateral agencies for work in the smaller urban and the rural areas, whilst donations in cash and in kind have been forthcoming from a host of non governmental agencies for development in areas of special interest such as refugee camps, resettlement areas etc.

Since the mid-1960s investments in the water supply and sanitation sector have steadily increased, reaching a peak during the International Drinking Water Supply and Sanitation Decade 1981-1990. The principal objective of this development effort was to extend the provision of safe and adequate drinking water and appropriate sanitation to as many people as possible as this is recognized as an essential prerequisite to the control of water-related diseases and is therefore accepted as being indispensable for the good health upon which rests personal well-being and national productivity and wealth. Such benefits will, however, only accrue if the water supply and sanitation facilities provided operate correctly and are maintained so that they continue to function and are utilized to their full potential by the beneficiary communities.

There is widespread evidence that though Operation and Maintenance is recognized as one of the major constraints for sector development, inadequate support has been provided to water agencies for improvements in this field during the past decade. It is discouraging that in the rural areas, where supply is frequently provided through point sources fitted with handpumps, a high percentage of facilities are reported as being out of order. Figures of 40%, 50% and 60% have been reported but this is an area where reliable data, perhaps not surprisingly, is not readily available. In urban areas, poor O & M has resulted in unaccounted for water being reported as more than 50% of produced water in many large cities in developing countries. In the served areas of these cities, wastage is very high and tariffs are often subsidized whereas the inhabitants of fringe areas remain unserved and pay the market price for insufficient and unsafe water from private vendors.

A shift in this situation is in progress. This can be deduced from conclusions and recommendations of Regional External Support Consultations and International Consultations which have recently taken place in association with the International Drinking Water Supply and Sanitation Decade (IDWSSD). Several external support agencies have been increasingly supporting Operation and Maintenance projects. The approach developed for Community Water Supply and Sanitation in the Eight General Programme of the Work of the World Health Organization, covering the period 1990 - 1995 emphasizes the importance of Operation and Maintenance for a better institutional performance.

Operation and Maintenance is frequently undertaken at the project level on an ad hoc basis. It is rarely implemented with any lasting success and there are many associated problems and constraints. There is a clear need for a number of actions to be taken in an effort to improve the situation. The implementation of these actions will be facilitated if a participatory approach involving developing countries and external support agencies is adopted. The present meeting has been convened by WHO and co-sponsored by the Federal Republic of Germany through the German Agency for Technical Cooperation (GTZ) in an attempt to consolidate a Working Group on O & M to strategize the integration of current efforts in this field.

This strategy will allow the development of realistic O & M policies and programmes from existing experience and will lead to the promotion of an adjustment of the balance between the allocation of project resources for construction and for O & M to ensure that facilities operate correctly and continue to function for the benefit of the communities which they are designed to serve.

2.0 BACKGROUND

The necessity of adequate operation and maintenance which will ensure the long term sustainability of water and sanitation investments has become a key concern in the water sector. 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 on operations and maintenance was established with the objective of improving the performance of operations and maintenance and held its first meeting in Geneva February 16 - 17 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 June 19-22nd 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 O and M 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 Geneva meeting was attended by some 40 participants from 25 different countries. (Appendix I). The attendees were all water and sanitation sector specialists, involved in operations 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.

A background paper reviewing issues and suggesting possible actions and activities was prepared prior to the meeting by Mr. John Kalbermatten. This paper served to focus attention on the more important general concerns in the sector. During the first two days of the workshop a series of case studies were presented from a number of developing countries describing specific operations and maintenance problems and strategies. These papers illustrated and elaborated many of the ideas expressed in the Kalbermatten document. The final two days of the conference were devoted to discussions by the participants of three major key issues:

1. Sector performance;
2. Institutional performance; and
3. Technology performance and environmental linkages.

The participants divided into three separate discussion groups. Each group identified the major problems associated with one of the three issues and proposed solutions and specific activities to improve operation and maintenance.

This document is a report on the deliberations and conclusions of the Geneva meeting. It reviews the key issues and conclusions reached and presents the specific activities suggested together with the major recommendation of the meeting.

The case studies presented to the workshop have been edited and are available in a companion volume which is obtainable upon request from WHO. These studies describe a variety of operation and maintenance strategies and approaches which are being applied in the developing world.

3.0 ISSUES

The failure of water supply systems once constructed is a serious threat to the provision of water. Generally systems fail because of inadequate operation and maintenance often associated with the employment of inappropriate water system technologies which the government or agency responsible is unable to maintain. Operation and maintenance of water systems in the developing world has been badly neglected and systems have fallen into disrepair. This has resulted in the serious deterioration of assets and the wastage of limited financial resources. In some countries rehabilitation has become, de facto a form of operation and maintenance. External support agencies are unwilling to contribute to on going operations and maintenance but are more agreeable to rehabilitating systems which are non-functioning. The argument is that it is usually more cost effective to rehabilitate a broken down system than build a new one.

Accurate data on the magnitude of systems failure are not available. Obviously the percentages of inoperative systems vary from country to country. In the literature a figure often quoted is 30-40% of systems inoperative at any one time while for individual countries and facilities percentages of 60 and 70 have been reported.

These rates of system breakdown give lie to the gross figures frequently quoted of people served and coverage at national and global levels. The actual numbers of people served are actually much less than those reported based on the number of systems constructed and their purported coverage levels.

A myriad of reasons have been identified as contributing to or causing the failure of water supply systems. These range from poor organizational structures in the responsible agency, lack of spare parts, inappropriate technology, lack of trained staff, tied aid, absence of career opportunities in the O and M sector, insufficient funds, legal framework problems, lack of motivation by sector personnel, non-involvement of the users, the low profile of operation and maintenance in the sector in general, inadequate

tariff and collection systems and political interference. These causes tend to be interrelated and intertwined.

The workshop which had the specific objective of identifying and proposing concrete activities to improve operation and maintenance performance concentrated on identifying the main reasons for poor operation and maintenance. Three broad headings: (1) Sector Performance; (2) Institutional Performance; and (3) Technology Performance and Environmental Linkages were adopted as locii to focus the discussions.

The key issues contributing to the poor operation and maintenance performance of water supply facilities 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 O and M
6. Inadequate Policies, Legal Frameworks and Overlapping Responsibilities
7. Political Interference

3.1 Inadequate Data.

There is an overall lack of data regarding operation and maintenance. Precise, accurate data on the number of systems which are not working throughout the world are needed together with information on the main reasons why. Detailed figures are also necessary to determine how much it costs to undertake an adequate operations and maintenance programme for various types of facilities in different countries.

A number of well managed and maintained water supply systems exist throughout the world. The costs and benefits of adequate operations and maintenance for these systems need to be collected to provide baseline information on how much adequate O and M actually costs.

Data are also required on the rates of breakdown of different systems such as pumping stations, distribution networks, treatment plants in urban systems, small gravity systems, and diesel motor pumping systems.

Until this information is forthcoming it will be impossible to accurately assess the overall performance of the operation and maintenance subsector and compute the financial losses due to poor operation and maintenance. These exact financial data are urgently needed to demonstrate to decision makers the advisability of implementing good operation and maintenance programmes in order to reduce losses to national economies.

3.2 Insufficient and Inefficient Use of Funds

Insufficient funding has been identified as a major contributor to poor operations and maintenance performance. This lack of funds hampers the operating and maintaining of water supply facilities as money is not available to buy spare parts, properly train staff and provide competitive salaries to attract high calibre personnel. External support agencies have traditionally been reluctant to finance operation and maintenance activities while national governments have often given it a low priority. National governments are frequently stressed for cash, especially hard currency which is needed to pay for spare parts and the water supply agencies usually lose out to other, judged more important higher profile sectors.

The users are a potential source of finance for water supply systems. They are often unable or unwilling to pay. Usually it is that they are unwilling to pay rather than unable to. Evidence is mounting that even in the poorest and most underprivileged segments of the community people are willing to pay for a reliable, adequate supply of clean water but unwilling to be charged for an unreliable and unsatisfactory service. It is a vicious cycle. As the service level drops due to a lack of operation and maintenance the users withhold support and become less willing to pay which further constrains operation and maintenance activities.

Sometimes it is the inefficient use of funds rather than a lack of money which contributes to poor operations and maintenance. The poor management of facilities results in the squandering of resources which then reduces the viability of the water supply system. Those responsible for managing water supply facilities need to look carefully at their operations to ensure that they are operating efficiently. Common problems are too often many unskilled staff and poor logistical and organizational structures.

Losses of revenue from unaccounted for water are a problem for most systems. It is difficult to define what is an acceptable level for unaccounted for water. A figure of 25% may be appropriate as a first target for an agency working at unaccounted for water levels of 50%, but significantly lower levels can and should be achieved. What is an acceptable level of unaccounted for water has to be determined on the basis of local conditions, but true wastage should not be significantly above 10% once illegal connections, free supplies, and leakage are reduced to acceptable levels and adequate metering, billing and collections procedures are maintained. High rates of unaccounted for water, whether they are caused by illegal connections, leakage, free water supply, or the result of inadequate commercial operations, result in significant financial losses and consequent poor service performance of the agency.

3.3 Management of Water Supply Systems

The operation and maintenance of water supply facilities throughout the world is undertaken by a wide range of differently structured agencies. These range from community owned and operated water supply systems at one extreme to government owned and operated utility companies at the other. Some agencies are very small and may only be responsible for the supply to a small rural village using a low cost technology while other agencies may be controlling a utility employing thousands of staff and operating a high technology system.

However, no matter what the scale of the facility, the system will perform poorly if it is not managed efficiently and well.

Typical management-problems include:

- inefficient organizational structures;
- absence of career structures for staff;
- low salaries; and
- poor relationships between the users and management.

The inefficient organization of many water supply agencies is a serious deficiency. If the organizational structure does not promote and allow efficient operation then the overall management will function poorly.

Personel problems are another reason for poor management performance. Low salaries, absence of career structures, lack of trained personel and the low profile of operation and maintenance as compared to new construction are all constraints. Some of these can be traced to a lack of sufficient funds in the agency but often they are the result of inadequate management.

The absence of transparent management and accountability to the users is another major issue. Often the customers are not involved in the water supply agency and there is no feedback from the consumers to the management of the utility. This is particularly acute in government owned and operated agencies which tend to be bureaucratic. This non involvement of the users in the management of the agency results in stress and in some cases the development of a confrontational relationship between the agency and the consumers. Studies of well run water supply agencies have shown that good customer relations and a sense of management responsibility to the users are common denominations in these organizations; contributing to their overall success.

One of the lessons of the International Drinking Water Supply and Sanitation Decade has been the recognition that the user needs to play an important role in the development, implementation and operation of the facilities if the intended service is to be sustainable over the long term. This role varies according to local conditions. In rural and periurban projects, the user is likely to be intimately involved in the

process and may assume planning, construction and, at a minimum, operating functions. In urban systems, his role may be that of an informed customer with opportunities to participate limited principally to commenting on agency proposals, because the technical complexity of sophisticated urban systems are not suitable for "hands-on" participation.

User participation must begin with the design stage, e.g. the intended user must determine what he is willing and able to pay for. Subsequently, management and operation of the agency must convince the user that he receives full value for the payment he makes. The means of doing so, other than providing good service, vary again with the local conditions and range from direct participation in the management by the user through boards or committees in rural and periurban organizations to public meetings, consultations and other participatory activities in the case of organizations serving urban areas."

3.4 Inappropriate System Design

No matter how good the management of a water supply facility is, if it is not well designed technically, it will operate inefficiently. Many water supply facilities have been badly designed, poorly constructed and use technologies which are inappropriate. When a facility is improperly designed and constructed even with the best will in the world it cannot perform satisfactorily.

There are many reasons for poor systems design. In some instances consultants are chosen by ESA's who are not familiar with suitable technologies for use in the developing world and specify equipment and/or designs which are inappropriate. In other cases, there may be political interference to promote one particular technology or equipment supplier and they may not represent the optimum choice for that particular situation.

A lack of communication between the system designer and the operators of the system is a further drawback. This applies equally to a rural village receiving a handpump well to an urban centre with complex facilities. The operators of the system need to be familiar with, approve of and be comfortable

with the technology. In addition there needs to be a continuous feedback of information from the operators to the designers to pinpoint problems with the design and suggest remedial measures.

3.5 Low Profile of Operation and Maintenance

Operation and maintenance in water supply agencies has a low, and usually an inferior profile as compared to new construction and system extension. Thus for career minded engineers the route to top management positions is recognized to be through new construction and not operation and maintenance.

The emphasis on and recognition given to new construction is partly due to its political visibility. The provision of a water supply to many developing world communities is a vote winning exercise while good operation and maintenance receives few political accolades.

Within the water sector there is an insufficient appreciation of the magnitude of operation and maintenance problems, importance and the skills required to properly operate and maintain the facilities. In part this is due to a lack of financial data. Accurate costs are not available which will demonstrate to decision makers the financial benefits of good operations and maintenance and conversely the losses to the national economy from poor operations and maintenance. An urgent priority in operations and maintenance is to collect precise figures which clearly show the financial benefits of operations and maintenance to decision makers in ESA's and national governments.

This low priority assigned to operation and maintenance by decision makers is a severe constraint. In order to improve operations and maintenance performance it must be accorded a high priority and importance by national governments in their programmes.

3.6 Inadequate Policies, Legal Frameworks and Overlapping Responsibilities

There is a need for clear sector policies, compatible legal frameworks and a clear division of responsibilities and mandates within the water and sanitation subsector. Due in part to the low priority assigned to operation and maintenance, no clearly defined policies have been enunciated which adequately address this issue. Commonly the lines of responsibility between the various organizations involved are

often blurred. This is particularly true of the relations between water supply and sanitation where the maintenance agencies usually have no or limited contact.

The policies of ESA's with reference to operation and maintenance are frequently different and may be at variance with the approaches of national governments. National governments and ESA's should collaborate and coordinate their approaches in order to achieve higher levels of performance for O and M.

3.7 Political Interference

Political interference has been identified as a serious contributing reason for poor operations and maintenance. This is most noticeable in countries where the government is directly involved in owning, operating and maintaining the water supply facilities. Political interference manifests itself in several ways. In some countries for political reasons water is free. This decision not to charge for water makes it difficult to run a self financing viable system, even if government provides funding. When governments are short of cash, often it is the water supply facilities which are soft targets and experience the greatest budget cuts.

Political interference is often evident in the choice of technologies. Government officials may for one reason or another support the purchase of a particular technology or system which may not be the best or most appropriate selection. Equipment suppliers and ESA's frequently hinder the wise choice of a technology by lobbying politicians or through restrictive policies of tied aid.

The contracts awarded for building even small rural water supply facilities are significant and there is considerable competition between contractors to be selected. In some cases the job may be awarded for political reasons rather than on the basis of performance with the result that the completed facilities may be shoddily constructed.

The working group concluded that a precondition for the better management of water supply facilities was to devolve the responsibility of managing systems from government to autonomous agencies which will manage the facilities under technical, financial and administrative guidelines from the government.

This would greatly limit the extent of political interference by governments and allow the facilities to be managed according to efficient business practices.

4.0 PRINCIPLES AND ACTIVITIES

The overall goal of the Geneva meeting was to develop a realizable number of concrete proposals for activities which could be undertaken and would lead to an improvement in the operations and maintenance of water supply facilities.

The participants focussed on identifying the key issues which constrain operations and maintenance performance and developed a priority set of specific activities to address these.

The activities proposed are designed primarily to be implemented by ESA's and national governments. The importance of involving the community was recognized but it was felt that the role of the ESA's and national governments should be accorded greater importance in this initial phase of a programme. Greater attention can be directed to the role and involvement of the users and user communities in subsequent stages.

The working group also established a number of overriding principles which should be incorporated into this new philosophy on operation and maintenance.

4.1 Principles.

Four overriding principles for operation and maintenance were adopted:

1. The group recognizes that the provision of water is a service which requires a service orientated attitude by the agencies involved. To ensure long term sustainability water should be managed as a commodity in exactly the same way as any other resource. Its use and exploitation should be on a financially sound and cost effective basis subject to the same legal and regulatory controls as other resources to ensure its conservation, protection and wise utilization.
2. The supply of water to consumers should normally be based on the principle of effective demand which can be defined as the standard of service that the users are willing to maintain, operate and finance to ensure adequate public health standards. The effective demand has to satisfy the priorities of the community at large.

3. Water systems should be managed and operated following the principles of good business practices. The form of management will vary depending on the local situation; ie. rural, urban, semi-urban, location, demographic structures etc. The responsible agency will be autonomous from government but manage the system under technical, financial and administrative guidelines set by national governments. The agency will be transparent and full accountable to its consumers.
4. Sanitation is recognized as an undervalued item in the sector and emphasis is required for sanitation development and for forging closer links between water supply and environmental sanitation (solid and liquid waste management) in the planning of new programmes.

The group, however also recognizes the legitimate concerns of government to satisfy the basic needs of the disadvantaged segments of the population. Governments may require agencies to provide service at lifeline tariffs for such groups or institute temporary subsidies to promote public health and economic development.

4.2 Activities.

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

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

Enhance Profile of Operation and Maintenance at Global and National Levels

Management Improvement

Data Collection and Operation and Maintenance Monitoring

Policy Formulation; Collaboration and Coordination

4.2.1 Enhance Profile of Operation and Maintenance

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.
5. Preparation of guidelines for issue by ESA's to engineers preparing systems to encourage the inclusion of operation and maintenance concerns in systems designs.

4.2.2 Management Improvement

1. At the global level to promote viable autonomous agencies which range at one extreme from a community based rural organization through to urban utilities to manage water and sanitation systems on a fully self financing basis for operation and maintenance.
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.

4.2.3 Data Collection and Monitoring

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. International methodologies for the establishment of performance indicators should be developed and existing WHO guidelines on evaluation should be reviewed to determine if they properly reflect requirements for adequate operations 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.
5. Studies should be initiated to determine the extent of cost saving and/or improvements to efficiency that will result from improved operations 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 operations and maintenance methods can be applied.

The working group suggests 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.

4.2.4 Policy Formulation, Collaboration and Coordination

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 would cause operation and maintenance problems.
4. A forum should be established to encourage the collaboration and coordination of ESA's and national governments at the country level in order to achieve common policies, unified approaches, compatible technologies and standardized equipment within the framework of national policies.

5.0 Recommendations

The present working group on operations and maintenance operates on an ad hoc basis and its lifetime is therefore limited. There was unanimous recognition by the meeting of the need for an international institution to act as a focal point and forum to promote, coordinate and strengthen operation and maintenance concerns.

The working group recommends that WHO with the support and collaboration of the other UN agencies, national governments and ESA's is the appropriate institution. It is further recommended that ESA's assist and support WHO through their participation in a professional advisory group to undertake these activities in the coming decade.

This advisory group should have a close link to the Collaborative Council of External Support Agencies.

Appendix I

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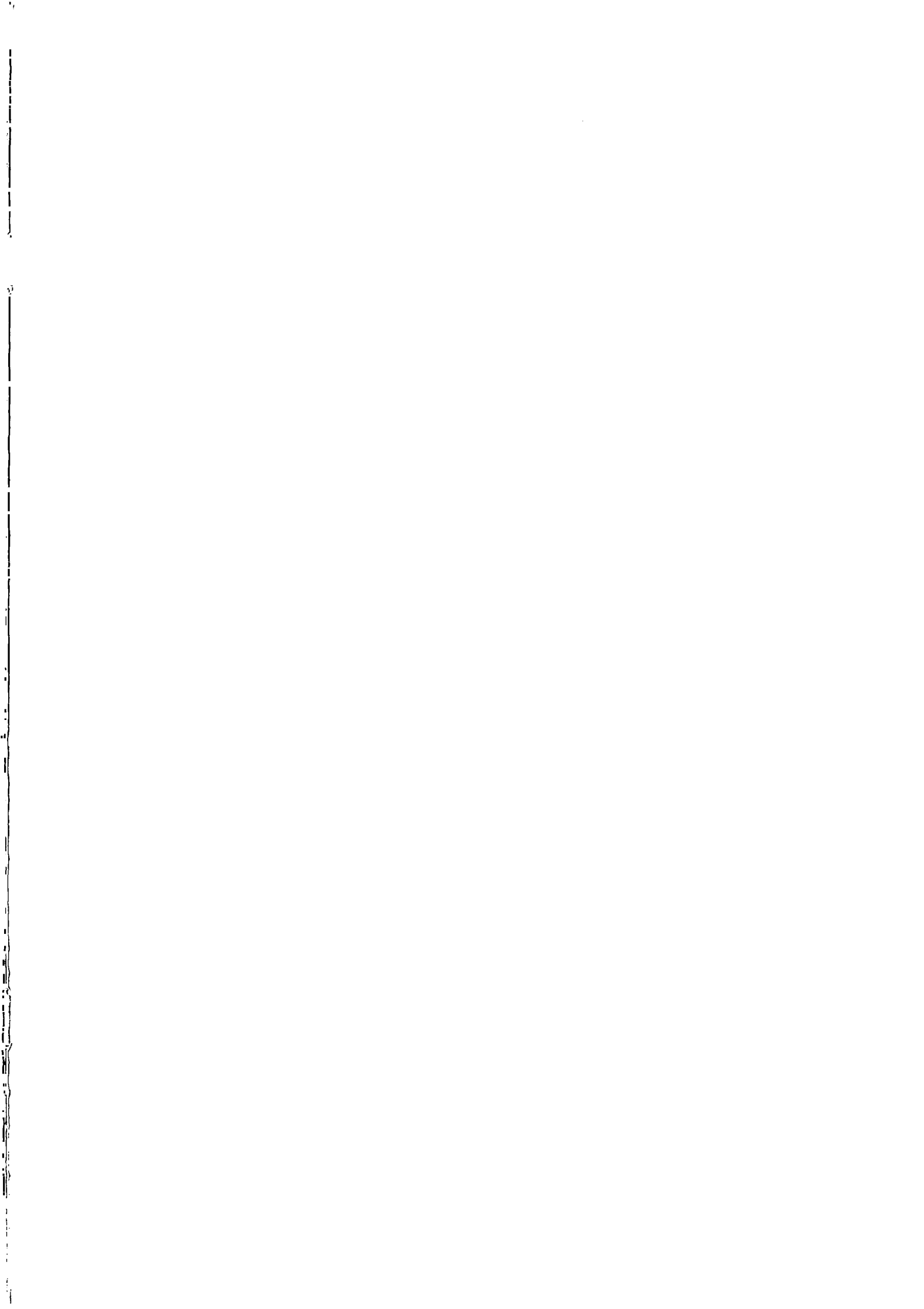
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