

**REGIONAL CONFERENCE ON WATER
SUPPLY AND SANITATION**

**Evaluation of the International Drinking
Water Supply and Sanitation Decade
and Projections towards the Year 2000**

Puerto Rico, 4-6 de September de 1990



**Efficient Use and Optimization
of Drinking Water Services**

**PAN AMERICAN HEALTH ORGANIZATION
ENVIRONMENTAL HEALTH PROGRAM**

**EFFICIENT USE AND OPTIMIZATION
OF DRINKING WATER SERVICES**

LIBRARY, INTERNATIONAL CENTER FOR
CENTRE FOR HUMAN AND WATER QUALITY
AND WATER QUALITY
1200 15th Street, N.W.
Washington, D.C. 20005

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I. INTRODUCTION

In order to provide continuity in the effort of the countries to evaluate the results of the IDWSSD, the Program for Environmental Health of the Pan American Health Organization is promoting and organizing a regional conference on water supply and sanitation in Puerto Rico, to be held from 4 to 6 September 1990. This event is prior to the XXII International Congress of the Inter-American Association of Sanitary and Environmental Engineering (AIDIS).

After evaluating the regional situation with respect to the decade, in this meeting it is proposed that the participants analyze a series of proposed orientations and guidelines for how to meet the demand for water during the decade that is now being initiated. This document seeks to present to the participants of the conference for their consideration and analysis guidelines for the formulation and implementation of programs that make it possible to achieve, in the short and medium term, efficient use of water, an improvement in its quality, and a rationalization of consumption, which, as a whole, will lead to the optimization of the services in the coming years.

II. CURRENT SITUATION AND STRATEGIES FOR ACTION

The analysis of the characteristics that define the current problem requires determining the internal factors that directly affect the low capacity of the sector to respond. Moreover, it is necessary to identify the elements or external causes that also affect that low performance.

2.1 Internal Analysis

The institutions that constitute the sector are, up to the present, directed almost basically toward planning and constructing new works, for both production and distribution of water. Thus, without intention, they have been losing their fundamental reason for existing: to operate, maintain, and administer those systems efficiently in order to guarantee to the community a service that meets its basic needs.

This change of objective from multiple causes, involuntary or not, has led to situations of inefficiency which are reflected in: extremely high water losses; consumption per capita above the averages for industrialized countries; and ever-increasing demands for volumes of water.

The total or partial absence of effective measures of control of consumption has contributed to the situation in which the levels of utilization of residential users is in many cases greater than 400 liters/inhabitant/day.

In terms of the provision of these services, upon evaluating the efficiency of the management of the infrastructure alarming indicators appear, such as:

- average losses of between 50% and 60% of the total produced;
- high costs of operation, combined with rates that do not cover them, resulting in a compulsory subsidy or the gradual deterioration of the services;
- lack of preventive maintenance at a fixed frequency and corrective maintenance;
- technological alternatives for projects that do not always correspond to the capacity of the users to pay, or sometimes application of technologies not appropriate for the environment in which they should operate, affecting not only the financing but also operation and maintenance during their useful life;
- to possible institutional deficiencies is added the lack of personnel trained in the techniques of proper operation, maintenance, and management that guarantee the continuous provision of services that are at least acceptable in quality and quantity;
- lack of managerial ability in the face of situations that are changing because of socioeconomic factors and lack of a capacity for dialogue with the political decision-making levels.

All these circumstances have obliged the governments to finance permanent construction of new works which, even so, do not cover the existing deficits. If this situation is not changed radically it will be impossible to meet the future demand that increases each day because of the accelerated process of urbanization in the countries of the Region.

As a corollary to the confusion in the objectives of service (to construct without giving priority importance to operation and administration), an institution has been created that sees its mission as that of selling water. This conceptual error of omitting consideration of the limited availability of this natural resource and the reduced capacity of the governments to meet an uncontrolled demand, in addition to the aforementioned circumstances, has led, as a logical consequence, to consideration of the sector as inefficient and lacking in prestige by higher authorities and the community itself.

In addition, as a product of this institutional attitude the concept has been created in the mind of the user that the household connection is a blank check that permits him to use and abuse the quantity of water that is delivered to him.

In turn, as the rates in most cases do not cover the real costs of the service, abuse is promoted which leads to closing the vicious circle of requiring the construction of new works, which, once carried out, again become insufficient, thus leaving the urban marginal groups permanently without attention.

2.2 Analysis of External Factors

To the inefficiency of the sector itself is added, as a consequence of the current economic crisis, the limited availability of financial resources from the state to the institutions responsible for the provision of the services. In addition, the image of inefficiency of the institutions also influences the limited allocation of financial resources since the sector is considered as requiring a permanent subsidy.

Neither is it taken into account that the water resource is limited in quantity and in quality and that there are other sectors that require water, especially for the production of energy and for agricultural irrigation, among others.

To the above is added the growing requirement on the part of the regions and cities of a policy of decentralization that results in the verticalization of decision-making and that leads, in the medium term, to the municipalization of services. This political decision seeks, in addition, greater democratization in decision-making, which implies effective participation of the users in these processes.

Increasingly found in the community is a greater awareness of the environment that is translated into social pressure toward the political entities not only to meet the needs of the entire population for service, but to achieve adequate management of natural resources.

Lastly, and this with no implication of limited priority, from the point of health view there is a pressing requirement to reduce the traditional risks to health characterized by water-borne communicable diseases whose causes are directly related to the coverage and quality of the water and sanitation services.

III. STRATEGIES FOR ACTION

Obviously, the response to the situation analyzed above is simply to increase the response capacity of the institutions responsible for the services, through internal and external actions that eliminate or reduce the limiting factors already mentioned.

3.1 Internal

There is an ineluctable need to optimize the capacity of the existing infrastructure through: the rational utilization of water sources; systematic, continuous efficient operation and

maintenance of the services; a quality of service that is guaranteed and controlled; gradual financial self-reliance that minimizes costs and makes the application of real rates to be paid by the user viable.

The following strategies that as a whole will permit the optimization mentioned are proposed:

- a) rationalization of consumption;
- b) control of water losses; and
- c) effective participation of the community in all its parts.

These strategies can be considered as a primary responsibility of the sector and of direct, internal incidence in the achievement of satisfactory levels of efficiency.

3.2 External

On analyzing the external factors that affect the low efficiency of the institutions of the sector, a new element was identified that will have great influence on the immediate future; it is related to the generalized implementation of the policy of decentralization of the bureaucratic apparatus at the national level. Thus decision-making will be carried out at the local and regional levels which will lead to the municipalization of the services. The implementation of this policy cannot be made in an improvised and hasty manner; it requires a careful process of planning and support in its implementation which should take in account the following aspects:

a) Municipalization of Services

In this process, in the planning phase one should consider as a basic criterion for transfer of delivery of services at an acceptable level of efficiency to the municipalities. Problems should not be transferred, but infrastructures with operating capacity. In addition, concrete goals to be reached should be incorporated as a requirement of the local receiving entity: to provide total coverage through the efficient use of the water; to optimize the installed capacity; to apply financially sound rates; and to guarantee the quality and control of the service.

Permanent support at the local level in order to avoid the deterioration of the services under municipal responsibility but, on the contrary, to increase their productivity in a continuous, sustained way.

Contribution with the local level in achieving standards of quality in the services that contribute to the real reduction of water-borne diseases, with constant coordination for their surveillance and monitoring by local health systems.

b) Change of Attitude of the Community

It is fundamental that the user does not continue to think that his only linkage with the service is the payment for it. He should be made aware of the elimination of wastage of the water within his residence and that this service is for meeting a need with reasonable quantities of water. In turn, it is hoped that with his individual and collective attitude he contributes to its optimization. In summary, the user should be considered the external auditor of his service.

IV. PROGRAMS FOR THE OPTIMIZATION OF SERVICES

The problem described affects the great majority of the drinking water institutions in the Region and thus requires comprehensive solutions that reduce or eliminate the deficiencies indicated through the implementation of programs that are suggested below.

4.1 Program for the Efficient Use of Water

The efficient use of water both at the level of the system and of the user includes a harmonious set of interventions directed toward the achievement of a basic objective: to provide reasonable quantities of drinking water to all users in order to contribute to the health and well-being of the covered population. For this purpose the service should fulfill the six premises that characterize and qualify their efficiency:

- a) The drinking water system should provide service to all users (comprehensive coverage).
- b) The system should be capable of utilizing reasonable quantities of water from the source, providing it with adequate treatment; and distributing those volumes in order to serve the rational, individually metered consumption of each of the users of the population (quantity).
- c) In order to meet health requirements, the water delivered to the population should correspond to the standards of treatment established (quality).
- d) The drinking water system should function 24 hours a day every day of the year (continuity).
- e) The costs of the water billed to the user should be in harmony with the capacity to pay of the different types of users (cost).
- f) The fulfillment of all these premises should guarantee the beneficiaries of the service safety and in turn provide prestige to the institution and the personnel that carry out

the different functions of the system, thus creating a generalized credibility that includes the political decision-making levels (reliability).

For this purpose the execution of a series of programs is proposed that will lead, through their simultaneous and progressive application, to the optimization of the services in all their aspects:

- rationalization of consumption,
- control of losses, and
- prioritization of the preservation of the resource water.

4.1.1 Rationalization of Consumption

In the past the position was assumed that the water did not have a cost and as such was a good that did not need to be conserved. Thus wastage of water is frequently observed with no account being taken of the quantities necessary for personal cleanliness, the kitchen, the laundry, the irrigation of gardens, and other needs. It is not strange that the cleaning of sidewalks or foot-paths and paved areas is carried out with water instead of by sweeping as at present.

Thus it is necessary to create a conscience in the user in order to correct these habits of poor use and also to awaken the user to the need to repair his fixtures which frequently present continuous leaks that benefit none.

This situation requires immediate action aimed at rationalizing water consumption--not only domestic water consumption, but also industrial, commercial, and official use (special). For this purpose one should:

- a) Extend the coverage of metering in order to bill the service not by estimated consumption but by measured volumes actually utilized by the consumer.
- b) Establish rates that cover the actual costs of the service and that charge exponentially for the excess above those volumes that are considered reasonable to meet the basic needs of the residential user.

Obviously, these rates should at no time finance the inefficiency of the sector. In other words, they should be applied once the costs of production of the services have been minimized.

- c) Implement systematic, continuous control of the large consumers since they generally consume more than 40 percent of the water produced and in most cases do not represent more than 4% the total number of accounts of the institution.

In these cases the entity responsible for the service should create advisory units for these industrial and commercial users in order to evaluate the use of the water and suggest ways of reducing this consumption through the minimization of volumes utilized--by recycling water in industrial processes, for example.

- d) Establish rigid controls for state or official users which, in addition to consuming exaggerated volumes of water, in most cases do not pay for this service. First of all, direct or indirect payment for the service should be sought, a measure that can lead to a reduction in the wastage.

Setting maximum quotas of water per month in accordance with evaluated needs, compulsory payment for excesses, and application of sanctions, such as cutting the service, could be another of the strategies that reduce the poor use of water.

Another alternative could be offering to repair sanitary installations free of charge, collecting only for the materials used from the official establishments, and monitoring continuously in order to maintaining consumption within reasonable ranges.

Naturally, the actions proposed above cannot be implemented without adequate community participation, which will be the work objective of the social communication project.

The industry has also contributed in a way to increasing this poor use since it continues to make fixtures that require significant volumes of water for their proper operation. Thus waste is promoted while technologies exist that permit saving, such as toilets with low water consumption, adjustable shower heads, faucets that are shut off automatically, and other fixtures that would facilitate meeting needs in a more rational way.

An agreement between the production sector and the government for the production of plumbing fixtures that allow reduction of water consumption through use of controlled volumes should be another priority of the authorities of the sector; it requires negotiation with the state levels responsible for the regulation of the quality of the products.

4.2 Control of Water Losses

Theoretically, the losses represent the difference between the volume captured at the source and the total consumption by the different types of users registered through individual meters. However, sufficient data, that is, updated censuses of users, are not always available; not all the meters, macro and micro, function properly; and often an estimate of losses is made as a product of this deficiency of data.

The losses in a drinking water supply system can be classified in two large categories:

a) Physical Losses

Physical losses are those that induce a reduction in the availability of water, requiring an increase in production in order to meet the demand, and create an increase in the cost of the service.

Physical losses occur mainly because of:

Leaks

- in pipelines and distribution networks,
- in pumping stations,
- in treatment plants,
- in residential outlets (domestic, commercial, industrial, and public).

Spillage

- in feeder channels,
- in treatment plants,
- in pump housings,
- in regulatory boxes,
- in tanks.

Excessive Consumption in Processes

This consumption refers to the quantities of water utilized in an operation that surpass admissible and recommended standards by the practice:

- in the cleaning of filters and basins,
- in the automatic discharges from basins,
- in purges of pipelines and distribution networks,
- in the cleaning and disinfection of tanks,
- in the repairing of networks and pipes in general,
- in the cleaning and disinfection of new networks.

b) Commercial Losses

Commercial losses are those that impede the full capture of the income foreseen for the financing of the expenditures for the provision of the service. Commercial losses occur mainly through:

Free Official Consumption

- in public buildings and for special users,
- in green areas.

Extraordinary Consumption

- decorative fountains,
- fighting fires (eventual quantities without control).

Free and extraordinary consumption are consequences of political decisions and for reasons outside the domain of the institution responsible for the service. The implementation of proper measurement and determination of that consumption should allow keeping them under control.

Clandestine or Illegal Consumption

- by clandestine tapping (without registration),
- by deviation in the connection of the meter (by-pass).

Errors in Micromasurement

- by faults in meters (normal or induced),
- by incompatibility of the capacity of the meter with the consumption of the user (volume or flow),
- by error or lack of control in reading,
- for lack of adequate maintenance of the meters.

Errors in the Estimation of Unmeasured Consumption

- coverage of micromasurement insufficient,
- inadequate procedures in estimation.

From the analysis of what was stated it is deduced that the reduction and control of physical and commercial losses are almost in their entirety the exclusive responsibility of the institution providing the service, while the reduction of the causes that produce the poor use of the water are basically the responsibility of the users.

c) Components of the Program

The implementation of a program for control of losses is carried out through the different units adapted to different sub-programs and projects.

The projects constitute the planning of a set of activities that influence the structure, in the organizational systems and in the human resources of the drinking water and sewerage institution, with a view to providing a specific problem with a solution that is viable technically, economically, financially, and institutionally.

The execution of actions to evaluate results and facilitate the adjustment of activities and objectives should be focused within the systematic planning and control.

Those actions in practice are organized through projects that in turn are grouped into sub-programs for:

- strengthening the infrastructure,
- development of measurement,
- operation and maintenance,
- recovery of costs, and
- institutional support.

4.3 Prioritization of Water Conservation

Another aspect of vital importance in the social communication project is related to the importance of water conservation. At all levels individual and collective awareness should be created and promoted that the water resource is finite and that as we approach the twenty-first century the water resource will be submitted to large demand and growing uses that undoubtedly will affect its quantity and quality. Water pollution by domestic wastes of a biological nature added to industrial and agricultural contamination have caused a deterioration that will require expensive investments for treatment in order to avoid irreparable damage to health and also to provide water adequate for other uses.

Water conservation should be incorporated as an essential element in the planning of the multiple use of the water resources. Their rational use should be reflected and regulated in legislation which should incorporate protection of the quality in order to permit the utilization at reasonable cost of this natural resource that nature has put within the reach of man.

V. OTHER IMPACT OF THE EFFICIENT USE OF WATER

In addition to all the aforementioned benefits, among which it is worthwhile to emphasize the facilitation of the more rapid provision of comprehensive coverage to the population, the efficiency of the services, and the reduction of investments, other less important aspects not related to the environment should be indicated.

Rationalizing consumption and making efficient use of water will significantly reduce the volumes of wastewater, both domestic and industrial, to be collected, transported, and treated.

These economies and the requirement of smaller investments for treatment will make it possible to respond to a problem of contamination that requires an action in the immediate future.

In addition, in order to make the treatment of this wastewater viable financially, the possibility of other benefits should be taken into account, in addition to the control of contamination, such as the reuse of the waters treated in irrigation in agricultural production and in the production of animal proteins through hydroponics activities. Thus one can generate, near the cities, products with the least risk to health. Naturally, this activity should be coordinated closely with the health sector in order to monitor the quality of the reused water and that of the products generated by its utilization. This action at the local level will be the responsibility of local health systems.

Recognizing, in addition, the finite nature of the natural resource water, the possibility of its recycling after being treated can allow liberation of volumes of clean water that can be allocated to the water supply itself or to other uses that benefit the development of our countries.