

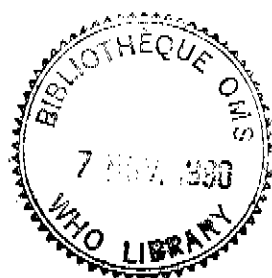
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COMMUNITY WATER SUPPLY AND SANITATION



WATER SUPPLY, SANITATION AND HEALTH IN RURAL AREAS

Report of a consultation of
the WHO working group on
Water, Sanitation and Health
Geneva, 27 - 28 June 1990

WORLD HEALTH ORGANIZATION, GENEVA, 1990



This report of the WHO Working Group on Water, Sanitation and Health presents the recommendations of a consultation on drinking water supply, sanitation and health in rural areas (Geneva, 27-28 June 1990). It contains a review of the present situation, and recommendations on planning, technology choices and support programmes to improve water supply and sanitation facilities in the villages and for the dispersed populations of developing countries, which are often deprived of adequate services.

(L. Laugeri, WHO/CWS, Secretary of the Consultation).

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DRINKING WATER, SANITATION
AND HEALTH IN RURAL AREAS
(WHO Consultation, Geneva, 27-28 June 1990)

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DRINKING WATER, SANITATION
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LIST OF ABBREVIATIONS

CHA	Community Health Agent
EAST	Eau Agriculture et Santé en Milieu Tropical - Drinking Water Agriculture and Health in Tropical Areas
FRC	Free Residual Chlorine
NGO's	Non-governmental organizations
UNDP	United Nations Development Programme
UNICEF	Unicef Nations Children's Fund
VDWA	Village Drinking Water Agent
WHO	World Health Organization
WSS	Water Supply and Sanitation

INTRODUCTION

The Consultation

An informal consultation was held at the Headquarters of the World Health Organization (WHO), in Geneva, on 27 and 28 June 1990, on the public health aspects of rural water supply and sanitation (WSS). The twenty members of this Working Group on Water, Sanitation and Health included Mr A. Guettat, Head, Water Quality Surveillance, Ministry of Public Health, Tunisia, Chairman; national managers of rural WSS projects (from Morocco and Tunisia), managers of non-governmental organizations (NGO's) which support similar projects in other countries (Burkina Faso and other Sahelian countries), technical advisers from international agencies (League of the Red Cross and Red Crescent Societies, UNDP, UNICEF) and national or communal institutions (from the Federal Republic of Germany, the Netherlands, the City of Paris), representatives of private interests in the water supply and sanitation sector (consulting engineers, water supply companies, chemical industry) and a representative of IRC, International Water and Sanitation Center. The membership of the Working Group and of the study teams, and a list of participants from the Secretariat, are in ANNEX I.

The consultation was opened by Dr D. Warner, Manager of the Community Water Supply and Sanitation Unit of WHO, who welcomed the members and recalled the background and objectives of this meeting on Water Supply, Sanitation and Health:

- to promote the implementation in rural areas of appropriate technology for drinking water supply and sanitation;
- to formulate support programmes based on community involvement and intersectoral cooperation;
- to design development plans and support activities for increasing coverage;
- to recommend measures for sustainable development, with respect to the institutional framework, the management and the human and financial resources of the sector;
- to identify projects which should be undertaken, and to define the role of WHO and other technical and financial support agencies;
- to constitute a Water - Sanitation - Health Working Group, and to prepare an action plan for this group.

The first five objectives were detailed in the documentation of the consultation, and are presented in ANNEX II.

In order to fulfill these objectives, the consultation undertook the analysis of an on-going project, described in a background document prepared by a non-governmental organization, Association EAST, Eau Potable, Assainissement et Santé en Milieu Rural (Drinking Water Supply, Sanitation and Health in Rural Areas). This document describes a project which is currently being developed in Burkina Faso; funds are provided essentially by another non-governmental organization, Eau Vive. Dr L. Monjour, President of Association EAST, recalled the background of the consultation during the opening session.

Present Situation of WSS in Rural Areas

The extension of drinking water supply services to the less privileged, and the provision to all rural dwellers of adequate sanitation, are constantly hampered by the constraint of dispersed habitat, as evidenced during the International Drinking Water Supply and Sanitation Decade (1981-1990). For these objectives to be fulfilled, a number of steps should be taken to improve the quality of services, as reflected in the characteristics of the water which is supplied to the consumers. The conditions of wastewater disposal in the environment, and of access to adequate drinking water supply and sanitation facilities, should also be improved. The purpose is therefore to optimize the quality and accessibility of existing goods and services, which are indispensable to life and health, rather than create and distribute a new product.

In order to cover the needs of one thousand million persons who are still without safe water, and of the many more who are deprived of adequate sanitation, WSS activities should be decentralized. In view of the strong tendency of water agencies to remain centralized, it will often be difficult to develop efficiently their regional and local branches. Decentralization will rely on community development rather than on "deconcentration". Where it is feasible to develop branches, these should coordinate their resources and efforts with those of other sectors which are more easily decentralized, for example public health or other sectors such as education or agriculture.

Because water supply and sanitation are integral parts of primary health care, and are essential to the success of health programmes, the cooperation of water supply and sanitation and health workers is required at village level. In villages, qualified public health workers are generally easier to find than teams specialized in the operation and maintenance of infrastructure works; the deconcentration of these teams is often not feasible beyond regional level.

During the first eight years of the International Drinking Water Supply and Sanitation Decade, more than 300 hundred million rural dwellers from developing countries were given access to safe water. To-day, more than 900 million people are still without service, and the beneficiaries of the Decade continue to be affected by qualitative and quantitative defects of WSS facilities. In Sahelian Africa, for instance:

- the number of improved ("modern") water points, particularly boreholes, is not sufficient to cover the needs: only 20 % of the inhabitants use them throughout the year for their water supply. This low percentage is essentially the result of a low number of boreholes per inhabitant (less than 1/1000 or 1/2000 on average): most rural dwellers do not have access to a borehole. The relative lack of interest results from the lack of information of the beneficiaries on the health benefits of the new services, and the difficulties of maintenance of the pumps which have been installed.

- although the water abstracted from boreholes is safe to drink in more than 90 % of the cases, it is generally subject to fecal contamination during its distribution. Even if it comes from a "modern" protected water point, the water which is consumed in the village houses is not very different, in terms of microbiological quality, from that which was drunk before the rural water supply improvement programmes were implemented. This situation is the result of the permanent pollution of the environment by fecal matters, and the behaviour of consumers who remain unaware of the fundamental rules of hygiene. The impact of water supply programmes is therefore considerably reduced, because health education and sanitation have not been included in these programmes.

Besides Sahelian Africa, in many other regions of developing countries, much progress has been made with regard to the quality of water supply and to a lesser extent to sanitation. The improvement of the health situation remains however less than expected. On a global basis, the low quality of drinking water supply, and of sanitation services, results in high mortality, perhaps of the order of 20 million persons per year, high prevalence of digestive parasitoses (of the order of 1.5 million persons per year) and of intestinal or hepatic amibiases, affecting some 10 % of the world population; 50 to 80 million people are still infected by the Guinea worm. Waterborne infections are particularly serious among malnourished children: 6 million of them at least are at risk of death each year.

Among those infectious diseases which are less directly related to water, malaria, schistosomiasis, tripanosomiasis, and other infections related to the sites of contacts between man and water are of particular importance. The subject of the present consultation is limited to those diseases which are contracted as a result of injection of water; this does not mean that the other infections should be neglected; there are for instance several hundred million people at risk in the case of schistosomiasis, and more than 1 000 million people at risk in the case of malaria.

As antibacterial and antiparasite drugs are costly, active treatment of infectious gastro-enteritis is difficult in tropical countries. The only solutions are preventive, and include in particular the disinfection of water for human consumption. The model recommended by the non-governmental organization Eau - Agriculture - et Santé en Milieu Tropical (EAST) is described at ANNEXE III. A model for the evaluation of the health impact of consumption of a chlorinated water in rural areas in Africa, also prepared by EAST, and implemented by this Association, is in ANNEXE IV.

SUMMARY OF CONCLUSIONS

The Working Group was divided into three teams, respectively responsible for defining approaches for the attainment of each one of three objectives of the consultation:

- objective 1: promotion of appropriate technology;
- objective 2: development of support programmes;
- objective 3: development planning.

The other objectives were essentially discussed in plenary session.

Issue I: Technology

In the field of appropriate technology, the members of the Working Group agreed to extend the scope of their investigations beyond the methods adopted and recommended by the Association EAST. Disinfection by "javeilisation" (use of sodium chloride) was used as a starting point for the discussions, leading to a critical analysis of some alternatives, for instance education and demonstration programmes and projects to convince people to boil water, or partial chlorination limited to the two to five liters/per capita/per day (lcd) which are required for drinking purposes.

The process of javellisation is widely used in many countries, for instance Tunisia where special recipients are used to receive Javel water drop by drop, in order to purify the water which is used in the villages. There are some problems, particularly with regard to costs: the cost of a borehole is thus increased by 60 % in the case of chlorination, for each family or household. Some problems are also reported with regard to taste, as a result of the presence of chloramine in water. Other methods have their drawbacks; to boil water for instance, requires the utilization of large amounts of wood, which is becoming scarce in some areas, especially in the Sahel.

The health, socio-economic and financial criteria which have been retained for technology choices are all related to the constraint of dispersed habitat, poverty of many rural agglomerations, and necessity to lower the level of pollution from the source to the consumer. This requires a process which should result in a lasting remanent effect ensuring safety of utilization; the technology adopted in procurement, construction, utilization, operation, management and surveillance should optimize the use of local skills and resources, and minimize the intervention of highly skilled personnel, as well as the acquisition of imported materials and equipment.

The procedures adopted are based on the complementarity of water uses. However, whenever possible, water for drinking purposes will be dealt with separately, as it requires more thorough and constant treatment and qualitative surveillance. The complementarity of water supply and sanitation, as envisaged in the framework of a sector approach, concerns not only drinking water supply, but also the disposal of used water and of refuse of all kinds, and drainage, usually by simple methods, such as required in villages, near the water point.

The issue of sanitary protection of this water point should always be addressed, but in the broad sense of keeping the surrounding area clean, and ensuring that it is protected from pollution and nuisance, rather than defining perimeters and issuing regulations which often cannot be implemented.

The Working Group emphasized the need to specialize those water points which are used for drinking purposes, and to develop water quality surveillance. It is therefore admitted that in rural areas the implementation of support programmes is as important as the adoption of appropriate technology.

Issue II: Support

The Working Group emphasized the role of education, especially health education and the need to widely disseminate the concept of a Water - Sanitation - Health relationship. The training of local supervisory staff is also regarded as very important. It concerns not only the public health education of WSS personnel, but also that of parents (of schoolchildren), stock keepers, village accountants, shopkeepers, and more generally all those who have a role to play with regard to drinking water supply, sanitation and water consumption.

The recommended technical approach results in an increasing number of sector agents at local and regional level, because of the preference which is given to locally available materials, equipment, and labour. The approach adopted for support programmes is well integrated in primary health care, both in terms of institutional framework and transfers of staff and financial resources; the examples given by most of the members of the Working Group illustrate the merits of the integrated approach, which mobilizes the resources of several sectors, for instance health or education, for programmes concerning agriculture, craftsmanship and agro-industry, commerce, land planning and the whole of the informal sector.

Issue III: Planning

The conclusions of the Working Group emphasize theoretical and practical training in hygiene, the need to promote water supply and basic sanitation, and the importance of the training resources required for the attainment of these objectives.

It is recommended that the Working Group should prepare a documentation for governments and financing agencies; it should analyse a few projects similar to the programme of Association EAST, but based on other technological approaches and different support activities, and it should use these case studies to promote the development of projects in the rural WSS sector.

It is also recommended that the Secretariat organize new meetings of the Working Group, which as much as possible should be enlarged to include personnel of the WSS sector from developing countries, and representatives of technical and financial agencies.

RECOMMENDATIONS

Team I: Technology

Team I prepared its recommendations on the assumption that two conditions were fulfilled, the most important being the existence of a source of water, the second one being that the pumping equipment should be in a good state of repair and operate satisfactorily. Recommendations were formulated in terms of resources, production and distribution works, storage and transfer, disinfection and sanitation.

RESOURCES

For boreholes and closed wells equipped with pumps, while water should be disinfected, the following should be ascertained:

- the top of the well should be watertight;
- the pumping equipment should be watertight;
- a protecting slab should be placed immediately after the construction of the well;
- the rainwater and used water should be drained;
- all waters should be evacuated toward a pit or some equivalent facility (filtering trench, or other technology);
- prior to their disposal, the wastewaters should as much as possible be used in irrigation;
- access to water should be limited by the clearly defined perimeter of a "clean" area, which should ensure near-by protection, as regulations to protect larger zones are in most cases not implemented;
- the distance from the perimeter to the center of the source to be protected should be standardized; this recommendation of the Team was not however adopted by all members; it would be difficult to recommend its inclusion in technical specifications for new works;
- provisions for compulsory analyses to be made in the technical specifications related to the reception of new works):
bacteriological analyses (total and fecal coliforms) and, after the stage of conditional acceptance, during the pumping test, simplified chemical test (iron, manganese, nitrate);
 - analysis of the water available at the final reception of the works (1 year after commissioning);
 - determination of treatment methods required; disinfection, after maintenance or repair works have been undertaken.

For improved wells (with casing) a feasibility study of spray chlorinators is recommended. For water used for drinking purposes only, it is recommended to close the wells with fixed pumping equipment. Traditional wells should be improved to the extent possible.

The team recommended that one water point be specialized for drinking purposes, that the source should as much as possible be isolated from the area where water is collected, and that the use of surface waters, which require treatment, be avoided if possible.

DISTRIBUTION

The study of recipients, already undertaken by EAST, should be continued, in various contexts: several issues such as cleaning, covering, filling, materials and costs should be addressed.

When the system includes storage facilities, water treatment should take place at this stage. The system should be simple, and disinfection should have a lasting "remanent" after effect; the use of dosing pumps and other complex equipment should generally be avoided.

Remanent chemical disinfection is recommended; other possibilities should however be explored. For a method to be valid, it should be based on the use of material and equipment available close to the users. The quality of these products should be assessed and monitored.

SANITATION

In many countries, for instance Tunisia, and some regions of Morocco, the latrines in use are of the simple pit type, ventilated, with squatting slabs. It is recommended to collect data on existing installations, to undertake new assessments of the latrine situation, by studying the existing documentation and projects, on-going projects, and the general evolution of this technology. The studies on cost recovery should be supplemented by the calculation of expenditures made for the construction and the maintenance of latrines; the systems should be as simple and low cost as possible, and designed to meet the various demands corresponding to various situations of concentration of habitat.

Team II: Support

The Team divided support activities between the main phases of the project cycle: preparation, implementation and operation, with cost evaluation and assessment of the institutional framework at each stage.

PREPARATION

The preparation phase includes preliminary contacts, discussion and negotiations with national staff, selection of local partners, definition of a general administrative framework and of the institutional framework of the sector, and allocation of tasks. At this stage, the source of funds will have been identified and secured.

The objective of the preliminary investigation will be to describe the environment and to define the strategic orientation and the reference indicators for subsequent evaluation.

The target groups, particularly school children and women in charge of households, should be identified.

The preliminary investigation will study the physical, socio-economic and sanitary aspects. With regard to the physical aspect, the geographical location and accessibility, and the problem of access to water, will be studied. The socio-economic aspects include means of communication, ethnic, religious, and other groups, predominant activities, available resources, access to trade, characteristics of habitat (including in particular the type of agglomeration), levels of literacy and school attendance, and the previous community profile, which should be defined, as well as its correlates with regard to sanitation, water supply and public health. The health aspects will include the communal and reference structures, the state of knowledge, the health programme, the study of existing equipments, the traditional attitudes vis-à-vis WSS and other sectors, and the bacteriological quality of water. The main difficulties encountered are generally related to the identification of control groups and the definition and choice of indicators.

IMPLEMENTATION

The system may be implemented by local partners (supervisors, institutions, community health agents, village water supply agents if they exist, members of various committees). The training need to be defined will be specific and adapted, as well as the general organization and the target population, the participation of which is essential. This community involvement requires the understanding of the Water/Health relationship, an agreement to participate in the total or partial funding of the works, the understanding of the rationale for preventive measures, and the provision of in-kind contributions (free supplies of materials and labour). The commercial sector should also be studied, and the review should include stock-keeping for chemical products, spare parts, and other important material and equipment.

The institutional framework will be studied at local and regional level, and the training needs of supervisors and other personnel will be identified. The issue of cost should be addressed when dealing with control of chlorination, as chlorometers are expensive; chlorination also raises problems of commercialization because it requires the storage and handling of important volumes of consumable goods, for a comparatively low expected income.

The implementation of the project will be supported at national level by campaigns, by radio and posters, at local level by training of facilitators, and at all levels by the procurement of the resources required for the projects, the adaptation of these resources, and the preparation of teaching aids.

OPERATION

The health education activities should be based on the school programmes, be detailed in a calendar, emphasize the Water/Health relationship, and follow the cycle training - demonstration - supply of the water supply unit-follow-up and control.

With regard to sanitation, community involvement is especially required for the preparation of the pits, the contribution of local materials and labour, for the latrines themselves, for the superstructures, and for the installation of protection perimeters.

Intersectoral cooperation should be organized. It concerns particularly vegetable gardening, which improves food diversification, and can be undertaken at the level of school-managed fields in an initial phase; sports and theatrical performances can be added to the programme; finally as started in the EAST project, the programme should be supported by an initiation of medicine at school level, and the distribution of medical kits.

The period from the start of the project to the total transfer responsibilities to the community is about three years. To this should be added, beyond the initial programme, a sanitary education activity which should be continued in the long term by the national agencies. It should however be emphasized that the community remains from the beginning to the end of the programme the initiator of all activities, and that it bears the general responsibilities, even though some support activities may require external contributions during some time.

Team III: Planning

The Team based its conclusions on the following general principle: "safety of drinking water, availability of latrines, and theoretical and practical health education, are as essential to the health of rural populations as access to services, and availability of water in sufficient quantity".

The objectives of the Working Group were to promote drinking water, the construction of latrines and health education at household level, in on-going projects and also in future programmes through sensitisation and consultation of the various persons who are active in WSS, and through proposals for innovative action.

The recommendations of the Team are as follows:

- disinfection projects should be planned in an "appropriate" manner *;
- the disinfection of drinking water should be developed;
- the local technicians and supervisory staff should be sensitised and trained in disinfection techniques;

* Disinfection techniques for the production of drinking water may be successful in a given region, and however not transferable to another region.

- all disinfection techniques should be checked before they are developed, so that those which are retained can be promoted, and their utilization can be justified;
- the Working Group should meet regularly , and it is recommended that the next consultation be held at the beginning of 1991;
- the Group will prepare a report of the present consultation, which will be distributed to the main persons and agencies active in WSS (especially government civil servants, cooperation agencies, non-governmental organizations, consulting firms, water distribution agencies, sanitation agencies and financial agencies). In this report, the principle of disinfection should be mentioned, without however relating it to any specific technique. The report, or its summary, can be presented at the meeting of the International Drinking Water Supply and Sanitation Decade, which will take place in New Delhi in September 1990;
- the Secretariat of the Working Group could organize study groups involving professionals, scientists and financial agencies, to promote the development of applied research in the Water - Sanitation - Health field;
- the Working Group recommends to intensify the cooperation between its members, in the form of joint actions, field visits, exchange of documents on on-going or forthcoming projects, including in particular the extension of activities undertaken by EAST and Eau Vive, or any other member of the Working Group. Each member could see whether concrete elements can be derived from his/her own activity to strengthen the collective action of the Group.

The Secretariat of the Working Group will examine a few projects, in the form of case studies illustrating the local conditions with respect to water resources and various approaches to water treatment, sanitation and health education; this study could be conducted before the next meeting of the Working Group; a project should also be formulated to prepare a background document for this forthcoming meeting, taking into account the criteria commonly used by financing agencies.

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AND HEALTH IN RURAL AREAS
(WHO Consultation, Geneva, 27-28 June 1990)

ANNEX I

ANNEX I-A-
MEMBERS OF THE CONSULTATION

Team I - Technology

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Mr C. BONNAL
Mr J. CHEZE
Mr A. GUETTAT
Mr T.A. MEROUAN
Mr B. N'DEURBELAOU
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Team II - Support

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Team III - Planning

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Mr R. DIERX, Technical Assistant, CWS
Mr I. HESPANHOL, Sanitary Engineer, CWS
Mr J. HUEB, Sanitary Engineer, CWS
Dr H. REJEB, WHO/FHE (Family Health)
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Mr L. LAUGERI, CWS, Secretary of the Consultation

ANNEX I-B
WORKING GROUP ON WATER - SANITATION - HEALTH
LIST OF MEMBERS

Mr J.C.	ANDREINI	Engineer, hydrogeologist, Deputy Director, Africa Department, BURGEAP, France (Team I)
Mr M.	AZILI	Project Manager, National Master Plan for Rural WSS, Ministry of Public Works, Morocco (Team III)
Mr C.	BONNAL	Consulting Engineer, COMPAGNIE GENERALE DES EAUX, France (Team I)
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Dr P.	EMPEREUR BISSONNET	Deputy Director, Association Eau, Agriculture et Santé en Milieu Tropical (EAST), France (Team II)
Mr E.	FIRMENICH	GTZ Technical Adviser to the General Direction of Water Affairs, Rwanda (Team III)
Mr Y.	GLEMAREC	Engineer, Office of the Chairman of the Cooperative Council, UNDP (Team III)
Mr A.	GUETTAT	Head, Water Quality Surveillance Department, Ministry of Health, Tunisia (Team I)
Mr H.	HEIJNEN	Programme Officer, IRC, International Water and Sanitation Center, Netherlands (Team II)
Mr C.	HOUDUS	Responsible Officer, Project Support Activities, Association Eau Vive, France (Team III)
Mr R.	KUHNLE	Expert in Rural Technology, GITEC CONSULT GMBH, Federal Republic of Germany (Team III)
Mr T.A.	MEROUAN	Responsible Officer, Water distribution, Office National de l'Eau Potable - ONEP (Team I)
Dr L.	MONJOUR	Chairman, Association Eau, Agriculture et Santé en Milieu Tropical (EAST), France (Teams I, II, III)
Mr B.	N'DEURBELAOU	Sanitary Engineer, Geophysicist, Consultant, Switzerland (Team I)
Dr J.P.	REVEL	Health Relief Adviser, League of Red Cross and Red Crescent Societies, Switzerland (Team II)
Mr H.	SPRUIJT	WSS Programme Officer, UNICEF, Rwanda (Team II)
Dr E.	STRIJAK	Under Secretary General, Technical Advisory Services, League of Red Cross and Red Crescent Societies, Switzerland (Team II)
Mr H.P.J.	VAN SCHAIK	Environmental Engineering Specialist, National Institute of Public Health and Environmental Protection, Netherlands (Team III)
Mr B.	VERHILLE	Sté des Produits Chimiques d'Harbonnières (Chemical Industry), France (Team I)
Mr L.	LAUGERI	WHO/CWS, Secretary

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ANNEX II
OBJECTIVES

ANNEX II

- OBJECTIVE I TO PROMOTE THE IMPLEMENTATION OF APPROPRIATE TECHNOLOGIES FOR DRINKING WATER SUPPLY AND SANITATION IN RURAL AREAS
- I A - Selection criteria
 - . public health
 - . social
 - . economic
 - . financial
 - I B - Specifications
 - . construction
 - . procurement
 - . utilization
 - . operation
 - . maintenance
 - . surveillance
 - I C - Methods
 - . complementarity of water uses
 - . specialization of sources
 - . complementarity of water and sanitation
 - . sector approach
 - . pilot projects
 - . replicable projects
 - . coverage programmes
 - . funding
 - . evaluation
- OBJECTIVE II TO DEVELOP SUPPORT PROGRAMMES BASED ON COMMUNITY INVOLVEMENT AND INTERSECTORAL COOPERATION
- II A - Water/Sanitation/Health relationship
 - . study
 - . documentation
 - . dissemination
 - II B - Importance within Primary Health Care
 - . institutional framework
 - . transfers of financial and staff resources
 - . structure of integrated programmes

- II C - Role of the Education Sector
 - . health education
 - . general education
 - . influence on behaviour
 - . sector policy
- II D - User sectors
 - . agriculture
 - . industry
 - . trade, informal sector
 - . land use planning

OBJECTIVE III TO OUTLINE A DEVELOPMENT PLAN

- III A - Coverage projects
 - . water
 - . sanitation
 - . large rural agglomerations
- III B - Support projects
 - . health
 - . education
 - . integrated agriculture development
 - . water resource management
 - . industry and tourism

OBJECTIVE IV TO PROVIDE RESOURCES FOR SUSTAINABILITY

- IV A - Institutional resources
 - . community organizations
 - . government agencies
 - . regulations
- IV B - Financial resources
 - . cost containment
 - . cost recovery
 - . liquidity maintenance
 - . resource coverage
- IV C - Staff resources
 - . community level
 - . decentralized agencies
 - . intersectoral action
- IV D - Management resources
 - . planning
 - . technical management
 - . administrative management
 - . financial management

OBJECTIVE V TO IDENTIFY ACTIONS TO BE UNDERTAKEN AND THE ROLE OF WHO AND OTHER TECHNICAL AND FINANCIAL SUPPORT AGENCIES

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ANNEX III

ANNEX III

PREVENTION OF WATERBORNE DISEASES
BY TREATMENT OF WATER FOR DRINKING PURPOSES
IN RURAL AREAS*

PROBLEMS IDENTIFIED

- Insufficient knowledge of hygiene
- Insufficient number of drinking water points
- Lack of reliability of pumping equipments
- Highly polluting distribution systems.

HIGH risks of fecal POLLUTION

RECOMMENDED SOLUTIONS

- Behavioural changes of users, through Health Education
- Improved access to drinking water
- Perennial water supplies
- Environmental protection.

These Actions are ESSENTIAL; but they are INSUFFICIENT.

- The pumps are far from the places where water is consumed.
- Water is highly subject to fecal pollutions.

* Source EAST

FOR AN EFFICIENT PROTECTION OF WATER CONSUMERS
AGAINST WATERBORNE AND FILTHBORNE DISEASES

Water SHOULD be TREATED for drinking purposes

CHEMICAL TREATMENT > MECHANICAL TREATMENT

- Pros

Powerful anti-microbial action, wide spectrum

Remanence of the disinfecting effect (+++)

Simple to implement

- Cons

Potential toxicity (low)

Relative resistance of some infectious agents

Requires the clarification of turbid water

DISSEMINATION OF A METHOD TO DISINFECT WATER FOR DRINKING PURPOSES

CHLORINATION - SELECTION CRITERIA

- Known to be effective, universal use
- Low acute and chronic toxicity / absence of risk
- Easy dosage of Free Residual Chlorine (FRC) in water
- Availability of a chlorine generating product: Javel water - NaOCl

Simple to manufacture locally

Manufacturing plans exist in developing countries

Low cost, already available to consumers

Easy to handle, to dose and to dilute in water, stable diluted solution

GENERAL CONSTRAINTS

- High rate of FRC after chlorination (1 to 2 mg/l)
- Pre-treatment required for turbid waters
 - Filtration
 - Flocculation-Sedimentation
- Individual users should be trained in the use of chlorine
- Availability and affordability of Javel water for users.
- Availability of structures to manage and monitor the service.

OBJECTIVES

To reduce significantly the mortality and morbidity of waterborne diseases and diseases due to lack of hygiene, through health education of the population, and organization of a local water supply unit.

PRINCIPLES

The implementation of water disinfection is a complement, rather than a substitute to other preventive measures:

- Health education concerning the water/health
- Protection against pollution of water resources
- Environmental sanitation

Health education (women, school children, younger children) is emphasized

Training of local supervisory personnel is emphasized

Water is disinfected for drinking purposes only

The existing structure is integrated and rapidly self-sufficient

2 ALTERNATIVES FOR RURAL OR PERI-URBAN AREAS:

INDIVIDUAL TREATMENT

- Pros

No specific equipment required, except at low cost (Drinking Water Unit)

Low cost of the disinfecting agent

Feasible, irrespective of the type of hydraulic equipment

- Cons

Every user is responsible - hazardous protection

Risk of dosing errors and poisoning

COLLECTIVE TREATMENT

- Pros

A single person is responsible - better protection

Quality and reliability of treatment

Low risk of errors and of poison

- Cons

Specific and complex equipment can be costly

Technology to be adapted to the type of water point, or "treatment bowl" near the source

Higher cost of treated water for user

COLLECTIVE TTT > INDIVIDUAL TREATMENT

CONSEQUENCES

AT HOUSEHOLD LEVEL

- Acquired knowledge results in behavioural changes
- Drinking water is not free and should be protected
- A new domestic product is utilized

AT VILLAGE LEVEL

- The function of Village Drinking Water Agent (VDWA) is created within the Water Committee:
technical manager (collective treatment) or retailer (and adviser - individual treatment)
- The VDWA is paid by the community and given a bicycle
- The VDWA agent, the Community Health Agent (CHA) and the institutions which are members of the Water Committee are trained
- The Committee controls income
 - Fixed charges or ad hoc contributions
 - Sale of water in the case of collective treatment
 - Sale of Javel water in the case of individual treatment
- The Committee controls the expenditures
 - Repayment of initial loans
 - Purchase of eau de Javel
 - Salary of the VDWA
 - Maintenance of the equipment
- Promotion of sales of Javel water by shopkeepers

AT REGIONAL LEVEL

- Training of trainers, provision of equipment to measure FRC
- Surveillance and follow-up by supervisory personnel from the relevant public agencies: Health/Water and Sanitation/Wells and Boreholes ...
- Consolidation and extension of the distribution network for Javel Water = State warehouses, village drugstores, authorized shop keepers, informal sector etc

AT NATIONAL LEVEL

- Support to the production of Javel water, quality control
- Promotion of sale of Javel water, and price control
- Assistance to manufactures, NGO's, local professional schools
- Training of public health supervisory personnel (in-service training of village agents)
- Public information through media campaigns
- Intregation of Health Education in school curricula

HEALTH AND ECONOMIC IMPACTS

=

IMPROVEMENT OF HEALTH AND LIVING CONDITIONS

DECREASE of MORTALITY and temporary or permanent DISABILITIES

DECREASE of CURATIVE HEALTH EXPENDITURES

INCREASE of WORK, STUDY and LEISURE capacities

JOB CREATION Local and regional (VDWA, water distributors)
 National (production of Javel water, construction materials)

BESIDES, in the case of construction of small piped networks

- Increase of the quantities of water consumed
- Improvement of individual and domestic hygiene
- Productivity improvements

- Decrease of time spent at the water point
- Increased availability for Health Education and training
- Free time for productive activities (agriculture, craftsmanship, trade)

EVALUATION

LONGITUDINAL STUDY over 1 to 2 years

+

COMPARISON with CONTROL POPULATION

2 INVESTIGATIONS TO - BEFORE the action

T1 - AFTER the action

SUBJECTIVE DATA

- Questionnaire to the users (women chiefs of household)
- Questionnaire to the members of the Water Committee
- Household record of children diarrhoeas

OBJECTIVE DATA

- Bacteriological analyses :
: of water in storage or distributed
- Dosage of Free Residual Chlorine :
- Presence of pathogens in the stools
- Studies of behaviour, housing, water points ...
- School record of absenteeism due to acute digestive affections
- Record kept by Community Health Agent of mortality due to diarrhoeas and dehydration (less than 1 year old)

DRINKING WATER, SANITATION
AND HEALTH IN RURAL AREAS
(WHO Consultation, Geneva, 27-28 June 1990)

ANNEX IV

ANNEX IV
EVALUATION OF THE HEALTH IMPACT
OF THE CONSUMPTION OF CHLORINATED WATER
IN RURAL AREAS IN AFRICA*

Introduction

Eau, Agriculture et Santé en milieu Tropical (EAST/Water, Agriculture and Health in Tropical Areas), a non-governmental organization, has undertaken since 1988 a programme entitled "School Drinking Water Units in Boulkiemde". This intersectoral development programme is based on the drinking water-health relationship, and has as its target population the 15.000 school children of the rural areas of Boulkiemde. This programme includes, among other subjects, a section on health education which is concluded by a practical training session on the chlorination of water for drinking purposes. A drinking water supply unit is provided in each classroom, and water is treated each morning.

Objective

A longitudinal study will be carried out over 1 year to evaluate the health impact of the consumption of chlorinated water by a group of school children in rural areas of Africa. The criteria for this evaluation are clinical (incidence of acute digestive troubles) and biological (presence of pathogenic microorganisms in the stools and bacteriological quality of consumed water). As in most studies of this type, the purpose is not to give formal evidence of a cause-effect relationship, but rather to evaluate the health benefits of improvements in the supply of drinking water, for populations at high health risk resulting from exposure to fecal contamination.

This evaluation is not based on a scientific research approach. It consists of an initial effort to demonstrate in practical terms the health benefits of drinking water supply, in order to facilitate the promotion of rural water supply and sanitation, particularly among national officials, and at community level.

* Source - EAST

Equipment and methods

The population under review is composed of primary school children. They are grouped into three homogeneous subgroups of 60 children each, with 2 teams by subgroup (the two teams are composed of children from the same school). The six teams are selected at random and have the same social cultural and ethnical background, similar water supply and sanitation facilities at village level, and similar public health structures and resources. An additional selection criterion is that health education has not been undertaken in those areas.

The three groups are as follows:

- Groupe 1, "bad": nothing is done, and the children continue to drink, at home and at school, water of poor bacteriological quality (this is the control group);
- Group 2, "variable": during three health education sessions, children are acquainted with the water-health relationship and with essential hygiene, and they learn how to use Javel water to treat the water which they drink at school; the water which they consumed at home is not treated;
- Group 3, "good": the criteria are the same as for the second group, except that the children receive instructions to treat water at home also; all day long, they drink water which meet the accepted standards of potability.

Data related to the chemical parameters are collected by the teachers. They count, once a week, the number of "acute digestive troubles" which affect the children in their teams. These troubles include diarrhoeas, abdominal pain, nausea and vomiting, with or without fever (the criterion "diarrhoea" corresponds to at least four episodes per day during four consecutive days). The investigation is "blank": the teachers are not informed of the results of the analyses of the water which is used by the children; thus they are not influenced in the collection of data related to the technical parameters. On the basis of the results obtained, for each team of pupils, the incidence of acute digestive troubles can be calculated over one year.

The biological parameters are of two types: those used in the analyses of stools of children and those applicable to the analyses of water consumed.

They are collected in three steps:

- T0: before any action
- T1: six months after the introduction of chlorination
- T2: one year after the introduction of chlorination

Analyses of the stools

The stools are collected at school and prepared in various cultures.

- Bacteriological analyses - These studies require the use of various cultures (data available with EAST - Laboratoires Merieux, Institut Pasteur) and concern five types of pathogenic bacteria (enteropathogenic *Escherichia coli*, *Salmonella*, *Shigella*, *Cholera vibrio* and *Campylobacter jejuni*).
- Parasitological analyses: microscopic study of the stools, before and after centrifugation, systematic search for vegetative forms and kystes and parasite eggs, which are frequently transmitted by water; the studies concern *Entamoeba histolytica*, *Giardia lamblia*, *Ascaris lumbricoides* and other parasites.

The search of viruses is not envisaged in the framework of this study, because it is too complex and costly.

The samples are sent to France and analysed in a microbiological laboratory. The results of these studies indicate the instantaneous prevalence of pathogens in the three groups of children.

Water analyses

Samples of water are taken at school and in the houses. The bacteriological quality of the water is evaluated by the research and count of Total Coliforms and Fecal Coliforms after membrane filtration. The control of chlorination by Javel water is done by dosing the Free Residual Chlorine. These analyses are done in local laboratories. They show the quality of the water which is consumed by each child at each one of the three stages of the investigation.

Interpretation of the results

The statistical analyses of the results of this longitudinal study will facilitate the interpretation of the evolution of the incidence of digestive disorders and of pathogens which are transmitted by oral absorption of water, starting from a given situation. The incidence is a function of the quality of water consumed at home and at school. Correlations can be established between the various parameters which are studied. The control group will serve as reference to evaluate the impact on the health of children of chlorination of water for drinking purposes.