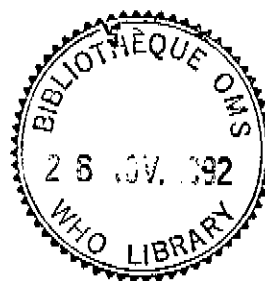


# COMMUNITY WATER SUPPLY AND SANITATION

## WATER SUPPLY, SANITATION AND HEALTH IN RURAL AREAS

REPORT OF THE THIRD CONSULTATION OF  
THE WHO WORKING GROUP ON  
WATER – SANITATION – HEALTH  
GENEVA, 10-12 JUNE 1992



WORLD HEALTH ORGANIZATION, GENEVA, 1992

This report contains the conclusions and recommendations of the WHO Working Group on Water Sanitation and Health, following its third consultation (Geneva, 10-12 June 1992) on the technical, institutional and financial aspects of development programmes in water supply, sanitation and health in rural areas. The reports of the commissions on these various issues are followed by documentation prepared for a meeting to be organized in Western Africa for planning and financing water, sanitation and health projects in some francophone countries. This documentation consists in project proposals which were previously formulated and have been updated by the Working Group. The technical contribution of the participants in the three consultations which have taken place until now are presented as annexes, to be used when formulating and implementing projects and programmes corresponding to the recommendations of the Working Group.

L. Laugeri, WHO/CWS, Secretary of the Consultation and of the Working Group.

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**WATER SUPPLY, SANITATION  
AND HEALTH IN RURAL AREAS**

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**WATER SUPPLY, SANITATION  
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**LIST OF ABBREVIATIONS**

CEFIGRE	Direction of International Cooperation - Internat. Office for Water
CIEH	Comité Inter Africain d'Etudes Hydrauliques
CREPA	Regional Center for Low Cost Drinking Water Supply and Sanitation
CWS	Community Water Supply and Sanitation
DESA	Direction for Health Education and Sanitation
DPS	Provincial Health Administrations
EAST	Eau, Agriculture et Santé en Milieu Tropical
EBAM	Ministère de l'Education de Base et de l'Alphabétisation des Masses
EHA	Direction of Hygiene and Sanitation
EIER	Ecole Inter-Etats d'Ingénieurs de l'Equipement Rural
EPFL	Ecole Polytechnique Fédérale de Lausanne/Génie de l'Environnement
ETSHER	Ecole Inter-Etats des Techniciens Supérieurs de l'Equipement Rural
FCFA	GFA Francs
HEP	Health Education Programme
HESC	Health Education and Sanitation Committee
KfW	Kreditanstalt für Wiederaufbau
NGO's	Non-governmental Organisation
ONEA	Office National de l'Eau et de l'Assainissement (Water and Sanitation)
ONPF	Office National des Puits et Forages (Wells and Boreholes)
POCHEP	Community Hygiene and Drinking Water Project
RHZ	Rural Health Zones
SAS	(Ministère de la) Santé et de l'Action Sociale
SIDA	Swedish International Development Assistance
UNDP	United Nations Development Programme
WHO	World Health Organization
WSS	Water Supply and Sanitation

## INTRODUCTION

### The Consultation

A third informal consultation was held at the Headquarters of the World Health Organization (WHO) in Geneva, from 10 to 12 June 1992, on the public health aspects of rural water supply and sanitation (WSS). The Working Group on Water Sanitation and Health, which had been constituted gradually during the previous consultations in 1990 and 1991, was represented by 15 of its members, including Dr L. Monjour, President of Association Eau, Agriculture et Santé en Milieu Tropical (EAST), Chairman.

The Group also included other managers of rural WSS projects, technical advisers from bilateral, multilateral and international support and financing agencies, and representatives of private interests in the water supply and sanitation sector. The membership of the Working Group, including the participants of the three consultations, is in Annex I. The breakdown into study teams of the members of the third consultation, and a list of participants from the Secretariat, are in Annex II. On the whole, about fifty persons take part in the activities of the Working Group.

The Consultation was opened by Dr M. Jancloes, Manager, Office of International Cooperation of the World Health Organization, who welcomed the members and recalled the objectives of the third consultation:

- to promote WSS in rural areas through health education;
- to develop support programmes at community level;
- to provide intersectoral support for sustainable development;
- to identify the actions to be undertaken;
- to identify the respective roles of the parties involved;
- to prepare a new consultation on specific projects, between the participants and others involved.

Dr Jancloes gave a broad explanation of some aspects of the general policy of WHO with respect to the countries which are in greatest need of its intervention, and within these countries, the poorest regions which were the subject of the present consultation. In these countries and regions, local resources were limited, and all efforts had to be made toward optimum utilization. This required that the priorities be defined by the countries themselves, in order to determine the orientation of external resources made available.

In view of the development objectives of the third consultation, Dr Jancloes shared with the Working Group some personal ideas on the Water, Sanitation and Health relationship, on programmes concerning the countries in greatest need of improvements in public health, and on the endemicity of the most important communicable diseases in Western Africa. His presentation was focussed on the lack of water and sanitation, and the interest of projects which integrate water supply, provision of latrines, health education, provision of essential drugs and other elements of primary health care.

The President of the consultation confirmed and developed some of these considerations, emphasizing the incidence of diarrhoeal diseases and the need of

health education, rehabilitation of numerous facilities which have become useless as a result of lack of care, sanitation in urban areas and small communities, and development at school level. The main issues of the previous consultations were recalled: drinking water quality, access to water, hygienic conditions, provision of latrines, education, facilitation and evaluation, and consolidation of isolated projects into major programmes.

### The Technical Presentations

The technical presentations which followed in plenary are presented in the annexes, which also include the contributions which had given its orientation to the Water-Sanitation-Health Working Group during the preceding consultations. These annexes thus summarize the technical work of the group.

This summary starts with a presentation made by Dr P. Empereur Bissonnet of Association EAST, on "Health Education in the Development of the Drinking Water Supply, Hygiene and Sanitation Sector" (Annex III). The second presentation of the consultation concerned the efforts made to eradicate dracunculosis; the prevalence of this disease should be regarded as one of the priority criteria in rural WSS development. The on-going projects of the Regional Center for Low-Cost Drinking Water Supply and Sanitation (CREPA) were then described, together with examples of research, particularly on continuous chlorination of rain water and the construction of rain water catchment facilities.

Other presentations followed, concerning the resources and training programme of Office International de l'Eau (CEFIGRE), the research on iodization of water at the source, some elements of the policy of a large financing agency with respect to Water-Sanitation-Health Projects (Annex IV), the financing policy of the non-governmental organization EAU VIVE (illustrated by films), the development of the Collaborative Council for Water Supply and Sanitation, education for hygiene and essential behaviours (Annex V) for the control of diarrhoeal diseases, appropriate technology for the disinfection of water points (Annex VII), and research on the development of irrigation and health in Western Africa.

The presentations quoted from the report of the preceding consultations concern chlorination (Annex VI), the evaluation of the health impact of the consumption of chlorinated water in rural areas of Africa (Annex VIII), iodization (Annex IX), treatment of drinking water for drinking purposes in rural areas (essentially slow sand filtration-Annex X), and the situation of drinking water in rural areas at the time of creation of the Water, Sanitation and Health Working Group (Annex XI).

### The Commissions

The Working Group divided itself into two commissions, in order to discuss on the one hand the technical aspects of water, sanitation and health programmes (Commission I), on the other hand the institutional and financial aspects of these programmes and the preparation of a planning meeting (Commission II). The conclusions and recommendations of each one of these two commissions are contained in the first chapter of the present report. The second chapter contains projects previously identified and updated during the third consultation, and a number of new projects. All of these project sheets will constitute the background documentation for the preparation of a planning meeting which will probably be held in Western Africa for francophone countries of this region, with the objective of financing water-sanitation-health projects in these countries.

### The Projects

The projects formulated in the second chapter are summarized here below:

PROJECT	COUNTRY	SUPPORT AGENCY	000 US \$ TOTAL COST	000 US \$ HEALTH EDUCAT.	POPULAT. CONCERN.
1. Study of the treatment and health impacts of drinking water	Burkina Faso	EAST	850	100	28 villages 6 schools indirect. 500 000 p.
2. Intersect. develop. in schools - Bazega province*	Burkina Faso	EAST WHO (SIDA)	500	100	All schools
3. Water sup., sanit. and health education in 500 villages	Mali	CREPA	700	160	150 000 inh.
4. Water sanitation and health education in 37 pr. schools	Burkina Faso	CREPA	400	60	28 000 children + families
5. Research & promo. of hygiene and sanit.	Mali	WHO/UNDP	1 400	200	villages
6. Pilot study for the qualitative improvement of water from lined wells	Sahel	EAST	60	10	villages
7. WSS in villages: - Sémé-Podgi, Abomey-Calavi - Adiva-Adina, Evon-Yao Kopé	Bénin Togo	CREPA CREPA	100 300	10 10	villages villages
8. Water san. health action plans for countries in greatest need	Western Africa	WHO	200	not avail.	to be determined
9. Creation of a reference laboratory for drink. water quality surveillance	Burkina Faso	EAST	500	not avail.	500 (Ouagadougou and 27 villages)

\* A similar project with the same external support agencies is currently at identification/formulation stage for Benin.



## CHAPTER ONE

### REPORTS OF THE COMMISSIONS

#### Commission I: Technical Aspects of the Water-Sanitation-Health Programmes

##### 1. Improvement of Previously Formulated Projects

###### 1.1 Background

- a) The commission started its debate with a review of community involvement. This was often limited to contributions in manpower, generally for new works, without the community being really involved in the choice of technologies or location of facilities. The members of the commissions agreed that this was not to be commanded.

The projects involving the members of the Working Group are generally more advanced, and give the beneficiaries an actual decision making role; however, their titles generally imply technical rather than participatory roles. It is therefore proposed to introduce in all projects a paragraph which should reflect the willingness of communities to learn and be involved: an example of such a paragraph is given in project no. 3 of the second chapter of the present report.

- b) In order to reduce the costs of the proposed facilities to low-income populations, the commission has examined the possibility to simplify an automatic chlorination process (based on solar energy) described by one participant. The device was found interesting because of easy adjustment, safety of dosage in chlorination, feasibility of iodization in association with chlorination. The device for proportional injections of the disinfection agent can not be modified; however, the protection superstructure can easily be built locally, in cement bricks covered with a corrugated iron roof. The company which commercializes the device will present a new cost estimate which will take into account this improvement leading to a reduction in the cost of production and transportation of the equipment.

Despite this, this facility probably can not be afforded financially by rural communities of less than two thousand inhabitants; it could be used in middle size or large villages or in suburbs of cities, especially on the high yield boreholes equipped with solar (or diesel) pumps. Reliability and durability tests are required in extreme operational conditions in Sahelian countries.

Following the same objective of cost reduction, the rain water catchment (impluvium) system presented by CREPA, appeared as a promising solution for rural communities which suffer from lack of drinking water in adequate quantities. The research seems to be well advanced, and important technical aspects (dimension in relation to rainfall and number of users,

bacteriological quality of water) are being studied; the projects which are implemented by EAST in schools could be used for the implementation of the results.

## 1.2 Notes on specific projects

- a) Project No. 1 - Burkina Faso. Treatment of Water for Drinking Purposes and Health Impact Evaluation.

The commission suggested that the projects should include the solar energy automatic chlorination system previously mentioned among the six collective treatment models to be tested.

- b) Project no. 3 - Mali - Water, Sanitation and Health in 500 villages.

The members of the commission, found that the formulation of this project was not clear, and proposed changes which are incorporated in the relevant paragraphs of the project description (definition, justification, objectives) in chapter two here after.

The other sections can remain unchanged, except that a paragraph should be added on community involvement, as suggested in 1.1a) above; this has also been done in chapter two.

- c) Project no.2 - Burkina Faso - Intersectoral Development in Schools - Bazega Province -

The Commission recommends to add at the end of the paragraph on "Implementation and Costs": "The results of the studies which are being carried out on rainwater catchments (especially by GREPA) will be applied within available resources, so that the schools which have metal roofs but do not have nearby protected water points can be provided with equipment for rain water catchments".

- d) Projects in specific villages (example of Togo)

Although all the data required for these development actions are not yet available, the Commission has tried to formulate a project according to the formulation model utilized by the Working Group. This formulation is in the second chapter (Project no. 7).

## 2. Futures activities of the Working Group

The Commission recommends the following issues to be addressed by the Working Group:

- community organization and involvement;
- health impact of these projects;
- appropriate technology for effective water treatment;
- collective water disinfection;
- free residual chlorine in drinking water;
- production and distribution of Javel water in developing countries;
- choice of hydraulic works for rural populations.

**Commission II: Institutional and Financial Aspects of the Water-Sanitation-Health Programmes.**

The Commission was requested to study:

- the preparation of a meeting of financing agencies for the countries of West Africa;
- the activities of the Water-Sanitation-Health Working Group.

The Commission made the following recommendations:

**1. On the Institutional and Financial Aspects**

**1.1 To change the approach**

Start activities by giving the population the choice of its priorities: water, health, habitat, etc. This involvement should be the basis of all institutional development. Just as techniques evolve, the methods of collective consultation and organization are constantly improved to support the activation of communities and favour arising social transfer.

**1.2 To promote the creation of National Water-Sanitation-Health Committees**

which would include representatives of public services and of local communities. These committees would provide opportunities for exchanges of information, study of the needs in water, sanitation and health, and national policies to be implemented.

The National Action Committees created for the International Drinking Water Supply and Sanitation Decade which are still active in some African countries (e.g. Zaire), should be encouraged to continue their work, while redefining their membership and objectives. These committees, and the relevant authorities should also be assisted in order to define, on the basis of preliminary studies, the future institutional structures which would be best able to ensure the success of field actions. In the case of Zaire, the planning and implementation of improvements in rural WSS facilities have mostly been directly coordinated with the national programme of primary health care, for several years, at the level of the rural health zones (RHZ). Each RHZ covers the population of about 100 000 rural inhabitants, located in about one hundred villages and rural centres.

Each national sector agency in charge of a national rural WSS programme should also be guided and assisted for the preparation of specific projects based on the wishes expressed by the rural population, and at the same time financially viable and likely to be of interest of financing agencies.

Each country could thus organize the composition of a National Committee, based on the mode of representation of the country (municipalities, village groups ...) and in relation to the ministries concerned with water, health, local government, agriculture, public works, plan, finance ...

The representatives of the population and the national decision makers should be fully conscious of the complementarity between:

- . curative and preventive actions in health;
- . quantity and quality in water.

Generally, the rural or national demand emphasizes improvement in curative action and water quantity. This is justified by health care needs and the lack of water. New programmes however emphasize the preventive aspects (health education, sanitation) and the qualitative dimension (drinking water). Water related mortality is due partly to the actual lack of water, but much more to its poor quality and its contamination.

- 1.3 To identify the existing operational structures (public and private), country by country, with the help of WHO and of national and foreign sanitary engineers.
- 1.4 To organize meetings within a region or between several regions of a country, between the national committees and the financing partners. These meetings would provide opportunities for an improved regional consultation, the harmonization of external supportive actions, and the presentation of well identified projects to financing agencies.

They would also give an opportunity to reconcile the interests of the various partners, and to find possible adjustments: for instance in co-financing terms (to avoid that the best offer be always favoured) or in the methods of intervention of non-governmental organizations and bilateral aid agencies.

The Commission preferred the word "Consultation", as opposed to "Round Table" generally reserved to financial negotiations. It is hoped that these consultations would take place near the African communities, and that the priority would be given to financing projects in the countries most in needs.

## 2. On Field Actions

### 2.1 To start new activities

- . by starting dialogues with communities;
- . by helping them to express their needs and their priorities;
- . by informing them of the interactions between water, sanitation and health. The health arguments are not necessarily the best to stimulate actions. Some latrine construction programmes have thus been promoted on the basis of the perspective of improvements in the standard of living. Similarly, precise notions of water treatment, sanitation, hygiene, are often not known, and the role of the facilitator is to explain these notions and the relevant techniques, in order to stimulate demand;
- . by seeking with the community the most appropriate solutions; the cost of equipments, their reliability, and the local feasibility of maintenance and funding will be taken into account. An alternative to the acquisition of new equipment consists in rehabilitating existing works.

### 2.2 To continue and improve on-going activities

- . because they are innovative, field actions can usefully stimulate the information and the reflexion of National Committees;

as the needs of populations have priority, the field actions should be pursued in order to meet these needs, with the greatest possible care, until more precise national plans are elaborated;

the support of WHO to these programmes is strongly hoped for, and it is recommended that WHO checks that the participatory approach be well included in the projects as presented;

WHO could also promote and validate these programmes by giving them a "quality label" for those villages which meet a number of criteria in terms of drinking water, sanitation and health education. The Zaire experience can be mentioned again. A "healthy village" is defined as a village which has a development committee, where all households have access to a source of drinking water, where at least 90% of the households have a sanitary latrine, and where the grass around at least 90% of the houses has been cut. On the basis of routine visits of the technical personnel of the rural health zone (water-sanitation coordinators, nurses, doctors, etc) the chief medical officer of the zone evaluates annually all the villages included in the programme. The "healthy villages" are acknowledged and receive a prize. A similar procedure has been proposed for the "healthy districts" of towns.

### 2.3 To promote self-promotion, and participatory methods, especially with women

It has been shown in numerous programmes that the main guarantee of success is the free voluntary involvement of the beneficiaries. This approach requires preliminary information on the possibilities, their consequences for the population, the cost of maintenance, etc. KfW has evaluated 110 completed water-health projects. The importance of the involvement of the beneficiaries is carefully shown in this evaluation.

### 2.4 To avoid the discontinuation of responsibility

Responsibility can be discontinued at all stages of action: preparation (planning), implementation, management, evaluation. If for instance the users have to manage the supply, they should be associated in the preparation and implementation of the programme. This requires cooperation between the various participants in the same action, and a well defined breakdown of the functions.

The current trend is to give the functions of planning and control to the public services, and to leave the execution of programmes to private operators. However, some sectors which can not be financially autonomous require the intervention of the state: creation of water points in remote villages, health services, schools, etc.

### 2.5 To reinforce the linkages between field actions

This will result in the constitution of large scale programmes and the multiplication of the benefits of consultations and exchanges.

### 3. On training needs

#### 3.1 At village level

Starting from the planned actions, the training needs will be evaluated with the community. For instance: training for facilitation, technical training for implementation, for maintenance of the works, etc. The training of facilitators should be undertaken in cooperation with the village leaders, or better with the village committees if they exist. The training for the maintenance of the works will be done at regional or central level. These actions should be undertaken at the beginning of the programme.

#### 3.2 At regional and national levels

To request the assistance of the training centres already in operation, for instance the CREPA, for the training of craftsmen: pump repairers, masons for the construction of latrines or rainwater catchments etc.

with the support of these training centres, to integrate the training in appropriate technology in the high level technical training;

to develop the training of adults, and the training of rural facilitators;

to increase the number of sanitary engineers, reinforce this profession, and facilitate the creation of regional networks of engineers and sanitarians; avoid however to create in some cases a surplus of highly qualified personnel who would remain idle;

to consider training as a programme in itself, and not as a secondary aspect of a programme.

### 4. On the integration of water-sanitation-health programmes in the national economy

4.1 Health, what for? To live normally, with a work, a house, etc. The health objective therefore goes with better living, both individual and collective. A favourable economic environment is a positive factor for health.

It is recommended that the water sanitation health programmes take into account as far as possible the possibilities of improvement of standards of living, for instance by employing young national technicians, or engineers for the more important projects. Unemployment is serious among the young professionals, as a result of divestiture, budgetary constraints and weakness of the private sector.

In India, the SULAB International Programme gives work to numerous unemployed technicians (information and reports are available with the Collaborative Council of WSS).

It would also be advisable that each action or water-sanitation-health programme utilize all locally available human resources, create or promote sustainable employments, foster the development of economic activities (agriculture, handy craft, commerce, etc.) and increase the financial capacity of the collectivity.

4.2 Until the community reaches complete financial autonomy, it is advisable that the financing partners (government, agency) maintain sufficient support in order not to compromise the sustainability of the action.

- It is generally recommended, to orient the programme towards complementary and multisectoral actions (hydraulic, health, training, and rural areas integrated agriculture projects).

- It has been observed that the actions are often more difficult to complete in urban zones than in rural areas, essentially for technical reasons linked to lack of space and less community involvement.

#### 5. On the evaluation of the water-sanitation-health programme

5.1 Permanent follow-up is an integral part of action. It should be distinguished from external evaluation, which brings an appreciation on the results, during and at end of the programme. The evaluation can also lead to improve the implementation of the programme avoiding the continuation of errors and promoting the reproduction of success.

5.2 Evaluation can take 2 complementary forms:

. the exact and rigorous measurement of the situation before and after the programme;

. the evaluation of the various partners to the programme, on the difficulties, the community involvement, etc.

The participation of WHO in the follow-up and the evaluation of the programmes is most beneficiary. WHO can also play an important role in the circulation of information towards the governments, the financing agencies, the non governmental organizations and any other interested partner.

#### 6. Other points discussed by the Commission

6.1 The Commission has noted that WHO (CWS Unit at Headquarters) needs funding to undertake and support activities of initiation, formulation of guiding principles, and follow-up of projects in the field. It has discussed the action plan, which is among the projects of the second chapter of this report.

6.2 The Commission also noted that there exists a need for funds in the budget of each field project, for the sensitization of the population, the training of personnel and the operation and the maintenance of the equipment.

## CHAPTER TWO

### PROJECT FORMULATION

#### PROJECT 1

#### BURKINA FASO

#### DRINKING WATER TREATMENT AND HEALTH IMPACT EVALUATION

##### Definition, Location, Description

This is the continuation of an on-going project, and its extension to the provinces of Boulkiemde and Bazega (rural sub-sector, sedentary villages, Mossi groups, soudano-sahelian climate, water supply by wells, boreholes and surface water, few sanitation facilities). The study will include 7 treatment processes, each of which will be implemented in four villages: 2 in the Boulkiemde province and 2 in the Bazega province. The project as a whole will concern 28 villages. The health impact study will be carried out in six primary school classes, grouping about 180 pupils.

##### Justification and Objectives

The studies of the bacteriological quality of water show that fecal pollution occurs nearly always during transportation and storage of water, and that water which is safe for drinking at its source is generally unsafe when it is consumed in the household. The first approach of the project therefore consists in finding the ways to supply drinking water for consumption. The proposals will take into account the specificity of rural areas, especially the dispersed water points and agglomerations, and the low incomes. The documentation on water treatment in rural areas, and the data on the health impact of drinking water, are quite limited; research on these subjects will constitute the second approach of the project.

In the short-term (4 years), the project has two main objectives:

- comparison between several drinking water treatment processes:
  - . a model of treatment by the family, in the household,
  - . six models of collective treatment by the village, near the water points or in the center of the agglomeration.
- evaluation of the health impact which can be related to the consumption of drinking water.

The implementation of this project will be supported by preventive health actions: education, equipment and protection of water points, sanitation. In the long-term, the results and references of the project could be used in the definition and promotion of a few simple water treatment and sanitation measures, which - together with health education - would be widely disseminated and applied in rural areas, and therefore could contribute to the improvement of human health.



### Institutional Framework

After consultation and concertation, the project will be implemented by the population, which will contribute to the cost of constructing and operating the facilities, and the administrative and technical services of:

- . the Ministry of Health and Social Action, particularly the Direction for Health Education and Sanitation (DESA), and the Provincial Directions of Health (DPS).
- . the Ministry of Water, and the authorities under it: ONPF (National Authority for Wells and Boreholes) and ONEA (National Water and Sanitation Authority)
- . the Ministry of National Education, particularly the Provincial Directions of Education and the teachers.
- the technical and financial support agencies:
  - . EAST for health oriented technical support;
  - . EAU VIVE, for support in water engineering and in the mobilization of funds;
  - . WHO, for its capacity to coordinate, disseminate information, its assistance in fund raising, and its technical support, especially in health education;
  - . any other interested structure or agency.

The action is proposed by the NGOs EAST and EAU VIVE, and is a follow-up of the studies already conducted by EAST since 1985 on water pollution sources and disinfection methods; these studies have been implemented since 1988 by the water supply programme in the schools of the provinces of Boulkiemde and Bazega, recently with support from WHO.

### Duration, Costs, Beneficiaries

The project will start in January 1992 for a duration of 4 years; there will be two evaluations, one at the end of the second year, and one at the end of the project. Its cost is 4 218 000 FF (US\$ 850 000), and the budget is as follows:

	FF	
- Water treatment (equipment, operation, analyses)	340 000	8%
- Equipment of water points and sanitation	582 000	14%
- Training and promotion	2 372 000	56%
- Health impact study	407 600	10%
- Evaluation	100 000	2%
- Miscellaneous	184 400	4%
- Administrative and management overhead expenses	232 000	6%
	<hr/>	
Total:	4 218 000	FF

The project will benefit some 14 000 persons, living in 28 villages, and it will probably have indirect effects on more than 0,5 million, plus other countries where it can be reproduced.

## PROJECT 2

### BURKINA FASO

#### INTERSECTORAL DEVELOPMENT IN SCHOOLS

#### BAZEGA PROVINCE

##### Institutional Framework

- In Ouagadougou Ministry of Health and Social Action (SAS)  
Ministry of Basic Education (EBAM)  
Direction of Education for Health and Sanitation
- In Kombissiri Provincial Direction S.A.S.  
Provincial Direction E.B.A.M.
- at local level (first year):
  - . 90 teachers from 30 rural primary schools (directors and teachers)
  - . 5400 pupils and their parents
  - . 15 community health agents and nurses

##### Justification and Objectives

Rural area with dry climate. Main ethnic groups: Gourounsi and Mossi, farmers, sedentary, animists. Lack of health care centers and absence of sanitation infrastructures. High levels of morbidity and mortality due to infectious diseases, most of which have their origin in the fecal pollution of drinking water and the lack of hygiene. 90% of the population is illiterate, 30% of the children go to schools; there are 80 primary schools and 20 training centers for young farmers (CFJA) all of which are under-equipped. Traditional monoculture cereals (millet); some market gardening. Self-sufficiency is difficult to attain with respect to food. The food diet is not varied. Malnutrition is frequent and affects 30% of the newborn.

The objectives are to improve the health and to promote the self development of rural populations, to disseminate in simple form the fundamental notions of preventive medicine and to train local managers and promote the development of self-operated and self-financed structures. In September 1988, EAST started the project "Water Supply Facilities in Schools" which concerns the rural establishments of the bordering province of Boulkiemde (150 schools and CFJA: 15 000 children). The project initially focussed on health education, water supply and sanitation; its scope was widened to cover other sectors, especially agriculture, school medicine and interchanges with French schools. The feasibility of the programme is the result of a strong engagement of the teachers and of the parents of the pupils. It is now envisaged to undertake this project in Bazega. The objective is to work during 5 years in all the rural schools of the province, which represent a target population of 19 000 children from 7 to 15 years old. The project has been in operation since 1992 and has also received financial support from WHO in 1992 (US\$ 65 000 including US\$ 40 000 for Bazega - Swedish funds - SIDA).

## Phasing and Costs

The team is constituted by 1 expatriate medical officer (specializing in Public Health and Tropical Medicine), 1 Burkina Bé training specialist, recruited and trained by EAST and assisted by 1 health agent from the DPSAS of Bazega. Thirty schools are concerned during the first year.

- training of teachers and health education of pupils: at the beginning of the school year, all the teachers attend a training session. For each class, there are three health education workshops per year;
- water supply and sanitation: drinking water supply post (PEP); chlorination (Javel water); four-seat latrine, with double ventilated dry pits; sanitary protection of the hydraulic works utilized by the school; with community participation;
- agricultural production;
- health care at school: pharmacy kit;
- twinning arrangements between schools; other activities.

Studies on rainwater catchments, especially from CREPA, will be applied as much as possible to provide protected water supplies (from rainwater) to schools which have metallic roofs and which do not have nearby water points.

The zone of influence of the project will expand rapidly in order to cover the entire province within 3 years (37 additional schools during the second year, and 55 during the third year). During the last two years, the structures are consolidated, and EAST withdraws its support, which is replaced by complete local management. The total cost is FF 2 400 000 (US\$ 500 000).

For the first year of the project	<u>600 000 FF</u>
WHO	240 000 FF
Financed by Ministry of Cooperation	100 000 FF
Total-Afrique	50 000 FF
EAST	50 000 FF
Syndicat des Eaux de l'Ile de France	<u>100 000 FF</u>
Additional funds needed (4 years)	60 0000 FF + 1 800 000 FF

## PROJECT 3

### MALI

#### WATER SUPPLY, SANITATION AND HEALTH IN 500 VILLAGES

##### Definition, Location, Description

This project consists in the rehabilitation of 500 boreholes, and several complementary public health activities. It is located in Southern (Bougouni, Yanfolida, Kolomdieba) and Western (Kita, Bafoulabe, Kenieba) regions of Mali, and concerns some 150 000 people (100 to 500 inhabitants/village). It includes on the one hand construction in each village of one iron removal unit and improvement of latrines, and on the other hand reorganization of the water committees and health education of the users.

##### Justification. Objectives

Many boreholes equipped with hand pumps have been abandoned because of the high iron content of the water which they supply: the metal taste, the red color and the brown spots on the linen washed with this water make it inadequate for human consumption and for most domestic utilizations. The population leaves these useless water points and returns to the traditional sources, which are strongly polluted by fecal matters and are therefore dangerous to health. Some aspects have also been neglected when these modern water works were constructed, especially the health education of the people in the villages and the provision of sanitation. A first evaluation has shown that 500 boreholes have been abandoned in the South and West of Mali. In order to improve this situation, the national authorities have requested the support of the Regional Centre for Low Cost Drinking Water Supply and Sanitation (CREPA) and the Centre has developed two systems for the removal of iron from water in proportions of 75 to 90%. The purpose of the project is to rehabilitate the boreholes and operate them again, by installing 500 iron removal systems. The framework of the intervention is broadened to include the following:

- . health education of the population;
- . reconstitution and activation of the Water Committees;
- . training of local workers;
- . construction of 1 000 VIP latrines.

##### Institutional Framework and Implementation

- identification and planning phase: jointly conducted by engineers from CREPA and from the National Department of Hydraulic Works, in order to inform the responsible persons of all the villages about the projected activities, to carry out qualitative analyses of the water, and to prepare a schedule of works to be undertaken;
- pilot phase: the promotion and participation methods will be tested in 30 villages, as well as the health education equipment, the prefabricated iron removal units, and the training of workers and technicians;
- implementation phase: following the evaluation of the pilot phase, the

- implementation phase will be planned and executed with much larger resources, in order to meet the needs in the shortest possible time;
- resources of the executing agency: the national branch of CREPA, represented by the National Direction of Hygiene and Sanitation and by the National Direction of Hydraulic Works, will make its structures and qualified personnel available to the project; in Ouagadougou CREPA has trainers, engineers and technicians who will participate in the two first phases of the project;
- the programme will be defined by CREPA in agreement with the Ministries represented in the national branch. The Institute of Environmental Engineering (IGE) of the Ecole Polytechnique Fédérale de Lausanne, which is associated with CREPA, can participate in the project according to the needs;
- resources of the beneficiaries: each integrated village action will only be undertaken with the full agreement and the active participation of the water committees. An important contribution will be requested in the form of materials and labour.
- discussions with the community will provide an inventory of needs and agreement will be reached on the responsibility of each actor, on the time table of activities and on the timing and methods of supervision and evaluation. The project identifies "resources persons" and undertakes to train them; it ensures the actual existence of a local management structure, capable of organizing the works, promoting knowledge and maintaining sanitary equipments. The project is undertaken only after the community has demonstrated that it is ready to endorse the responsibility for the results and adopt the recommended facilities and the corresponding behaviours.

#### Duration. Costs. Beneficiaries

The identification and planning phases will last from 2 to 3 months, the pilot phase from 12 to 18 months and the implementation phase from 2 to 3 years.

The costs in million CFA Francs will be 12 for the identification phase, 15 for the pilot phase (construction of 30 iron removal units and 60 latrines, supervision and training of workers, health education) and 152 for the implementation phase (construction of 470 units and 470 latrines, supervision and training of workers, health education). The total cost including CREPA's management costs is about CFA Francs 180 millions (US\$ 700 000), for a population of about 150 000 people. The cost per inhabitant is therefore CFA Francs 1 200. The project integrates several activities: health education, drinking water supply, sanitation, training of labours, reactivation of village committees, and the expected health and environmental improvement in the villages justifies the proposed expenditures.

## PROJECT 4

### BURKINA FASO

#### WATER, SANITATION AND HEALTH IN 37 PRIMARY SCHOOLS

##### Definition, Location, Description

The objective of this project is to extend coverage in the provinces of Bulkiemde, Kadiogo et Youbritenga, in rural and semi-urban areas. In 1990, the Regional Center for Low Cost Water Supply and Sanitation (CREPA), in cooperation with the Association Ingénieurs du Monde of Ecole Polytechnique Fédérale de Lausanne (EPFL) built 2 blocks of 9 ventilated latrines for the school of Tanghin Taamila, which has more than 1000 pupils, in the suburbs of Ouagadougou. Following this construction, 37 primary schools located in villages and peri-urban squatter districts made a formal request to CREPA in Ouagadougou in order to improve their health status. These schools generally do not have adequate water supply and excreta disposal facilities. Each pupil, coming sometimes from more than 5 km away, must bring the water which he will need for the day. The schools have from 250 to 1000 pupils each, aged between 5 and 14. Following these requests, the project has been widened in order to include health education and the training of local workers as complementary aspects which will be indispensable in the long term.

##### Justification and Objectives

Any development project has as one of its fundamental tasks the improvement of the health and welfare of the population. One of the ways to reach this objective is to work with school children. Health education and information on problems of disease transmission, as well as operation and maintenance of the facilities, can be combined with local construction requiring community contribution in the form of sand, gravel or stones, and this has the effect of involving the entire community around each school. In order to be more effective, the project will concentrate on three provinces around the capital city, where population densities are the highest.

The objectives are as follows:

- health education: learning through information exchanges and lessons, with projections, role playing and visits of facilities, for teachers, pupils and parents;
- construction of facilities: 45 blocks of 6 ventilated piped latrines, 10 boreholes equipped with hand pumps and 25 rain water tanks;
- training of workers: to encourage the families, the communities and other schools to construct improved latrines with the help of qualified workers;
- sectoral development: the objectives of the CREPA are to promote low cost technology in the field of water supply and sanitation, to support pilot projects and applied research, and to coordinate the efforts undertaken in each country.

### Institutional Framework and Project Organization

The project will be executed by the national branch of CREPA, in which the ministries of water and sanitation, health and social action and environment are represented, together with the institutions which are directly linked to CREPA, EIER, ETSHER, CIEH. The Institut du Génie de l'Environnement (IGE) of Ecole Polytechnique Fédérale de Lausanne, an institution associated to CREPA, can participate in the project as needed.

The ministries concerned and CREPA will rely on local contractors for the work requiring heavy equipment (boreholes). CREPA has also the organization required to monitor the quality of the water supplied.

A programme will start in a school only after the teachers, the parents or the village or district committee have made the commitment to participate actively in the works and in the health education actions. At the level of villages and suburban districts, each one of the 37 actions is already locally engaged, and has been the subject of a request; the communities are therefore responsible and actively involved.

### Duration. Costs. Beneficiaries

The project will last from 18 to 24 months following the agreement in principle on its financing. Longer term follow up is planned in the framework of the activities of the national branches of CREPA, in order to evaluate the impact. The operation and maintenance of the facilities will require only limited additional expenditures, besides the routine cleaning work done by the users.

Costs CFAF Million	
technical personnel, workers' training	20
health education, sensitization	18
construction of latrines, tanks, boreholes	65
contingencies and CREPA's management overheads	<u>10</u>
Total	113

The total cost of CFAF 113 million (at January 1991 prices) or US\$ 400 000, amounts to US\$ 14 per child. The local population deriving direct benefits from the project is about 28, 000 children. Numerous other persons will derive indirect benefits from the promotional and health education activities.

## PROJECT 5

### MALI

#### PROMOTION OF HYGIENE AND SANITATION

##### Description and Location

This research project on Promotion of Hygiene and Sanitation in rural areas will take place between 1992 and 1995. Mali, a continental Sahelian country, has an area of 1 million km<sup>2</sup> and a population of 7.6 million inhabitants, 84.4% of which live in rural areas. Mali is among the poorest countries in the region and in the world. Infant mortality ranges from 125 to 200 per 1000, life expectancy is 46 years for men and 48 years for women, water supply is available to 45% of the urban population and less than 19% of the rural population, sanitation facilities are available only to a few, and are particularly scarce in rural areas, less than 16% of children go to school (1986), and the literacy rate for women is less than 5%.

##### Justification and Objectives

Studies of the Hygiene Laboratory have shown that all the sources of water (wells, surface water) were polluted; even water from boreholes, which is safe at the source, is also polluted during transport and storage. Other studies have shown the low coverage rate in terms of latrines, and the ignorance of populations with respect to elementary action to be taken in order to protect their welfare.

The specific objectives of the project are as follows:

- a. Data collection on the rate of coverage of safe water supply and sanitation, how the facilities are used, what level of knowledge people have in environmental hygiene, and traditional practices which may be favorable or unfavorable to the promotion of hygiene.
- b. Treatment of data: problems which are familiar to the population, both in terms of causes and solutions, will be the subject of the implementation of this programme; real hygiene issues, however not perceived by populations which therefore are unaware of the solutions, will be the subject of an education component, with the objective of stimulating the perception of the problem, leading to the identification of causes, and motivating people to find a solution.
- c. The programme will include a construction component for each agglomeration; the facilities to be constructed will be adapted to the environment. Ten latrines will be constructed, including 1 in a school and 1 in a health center; 10 composting pits will be installed; 4 water points will be equipped, including 1 in a school and 1 in a health center; a "women literacy" component will be included in the project, as well as a component of education for the rational utilization of the works.
- d. Evaluation of the activation of the participatory structures of the rural communities engaged in the implementation of the primary health care policy. These structures consist of political organizations, agricultural groups or projects, local administration and health mid-management personnel.



## Implementation

Ten villages will be selected in each of the administrative regions of the country. A team composed of 1 sanitary engineer, 1 sociologist, 1 community development technician and several public health technicians will be in charge of the preparation of the questionnaire. The study will take place under the supervision of the sanitary engineer, with the support of the local public health mid-management personnel. The study will last for two months. The report will give an account of the current situation and provide guidance for the selection of the facilities.

For villages which do not have adequate well or borehole installations, the project will build the water supply installation with the help of the population. Health education will be undertaken on a permanent basis, and focussed on the promotion of hygiene and the protection of the environment. A literacy programme will be implemented. The health education programme will also concern the utilization and maintenance of the facilities.

The programme will include interim annual evaluations, and a final evaluation which will take place at the end of the fourth year. The main indicators to be used include the percentages of households equipped with latrines, and the percentages of project beneficiaries who are aware of the transmission of disease by water and excreta, and of the linkages between environmental sanitation and health.

## Institutional Framework

1. Government of Mali (Ministry of Public Health and Social Affairs); local population (labour, cash, materials);
2. WHO and other international and national agencies:

The cost of the project, including a national contribution of US\$ 180 000, will amount to US\$ 1.4 million (CFAF 350 million), equally distributed over 4 years, with 1/3 in personnel expenditures, 1/3 supplies for construction and equipment, 1/6 for the training budget and 1/6 miscellaneous.

## Note

This proposal has been formulated as a preliminary project by the Division of Hygiene and Sanitation of the National Directorate of Public Health, Ministry of Public Health and Social Affairs, Republic of Mali.

## PROJECT 6

### SAHEL

#### MEASURES TO IMPROVE THE QUALITY OF DRINKING WATER FROM LINED WELLS

##### Justification and Objectives

Lined wells are wells with large diameters (1.2 to 1.8m), and of an average depth of 25 to 30m. Their walls are concrete cylinders in which flows turbid or opalescent, rarely clear, water, which comes from the shallow aquifers. The higher element of the well, if it is above the surface of the soil, constitutes the curb stone of the well, which is generally open, and surrounded by a circular concrete slab of about 1m radius, which is supposed to stop the infiltrations of polluted surface water. Water is extracted with equipment which is stored on the ground. The water which is lost during withdrawal, as well as the rainwater, are not drained.

15% of the lined wells are contaminated by fecal matters; the average pollution rate is 10 fecal coliforms in 100ml of water. The reasons for the contamination of this water are the pollution of the environment, the lack of sanitary protection of the facility, the bad habits of the users. Besides, it has been observed that water, after having been drawn, is subjected to gradual fecal pollution during its transportation, its storage and its consumption in the household. It has been shown that the chemical disinfection of water, especially by chlorination, maintains the good quality of water until it is consumed.

In order to provide drinking water supplies to the villages which use lined wells, some measures are required in terms of health education of the population, sanitary protection of the wells and of the environment, and chemical water treatment. Protection and treatment are the two objectives of the present pilot project.

##### Sanitary Protection of Hydraulic Works

All fecal pollution sources - latrines, refuse, cattle farms, traditional wells - will be kept distant from the water point in order to avoid the contamination of the aquifer. A distance of 30m is usually enough. The protection perimeter includes a watertight concrete slab around the curbstone, with a circular drain which collects the lost water and evacuates it towards a pit or a watering trough a wall, 1m high.

Watertightness prevents the external pollution to penetrate the well, at all levels, and it requires cement joints (for infiltration water), concrete curbstone (surface and rainwater), concrete slab, sealed on the curbstone, closing the opening of the well. Protected water drawing systems facilitate the drawing of water and avoid the introduction in water of dirty recipients. Several systems can be recommended (pulley, etc.).

### Chlorination of Water from Wells

The disinfection of water directly in the well requires the immersion of a chlorinating pot or the daily introduction of chlorine. As compared to the individual treatment (in the household, in the storage recipient), the collective treatment of well water has the advantage of protecting the entire rural community from water-borne fecal pollutions by reducing the individual constraints.

#### Equipment and Methods (for 10 modern lined wells)

Rehabilitation of the elements of watertightness (cement joint, cover etc.), protection (concrete curbstone etc.) and water withdrawal (5 wells with pulleys, 5 wells with winlasses).

#### Chlorination

- Test A - daily evaluation of chlorine, daily evaluation of the bacteriological quality of the water (during one month);
- Test B - chlorination of well water by Javel water

#### 2 groups of facilitators

- The health education agents (physicians + public health workers), they teach public health and hygiene and are responsible for maintenance of the equipment and standardization of chlorination methods.
- The pupils in the schools are made responsible, and they chlorinate the water daily; they are already the promoters of safe water supplies in their families and they undertake to establish advisory and surveillance groups.

#### Expected Benefits and Costs

The objective of the pilot study, which will last 6 months in 1993, is to standardize the methods to be promoted in order to obtain drinking water from wells. On the basis of a vast programme of health education at school (Boulkiemde and Bazega provinces - Burkina Faso) and knowing that the bacterial contamination of lined wells is relatively limited, it seems feasible to ensure a daily supply of safe water.

The provisional budget is FF 323 000 (US\$ 60 000), including 125 000 investment costs and 198 000 operational costs (of which about 36 000 is for health education).

## PROJECT 7

### COUNTRY PROJECTS

#### A/BENIN

##### Definition. Location. Description

Improvement of drinking water supply and construction of basic sanitation facilities in villages of the administrative centres of Sémé-Podji (Ouémé) and Abomey-Galavi (Atlantic).

##### Justification. Objectives

In these two centres, the waters are often brackish at less than 3 meters depth, thus the populations are obliged to walk up to 4 km to have access to an adequate water source. This task is essentially undertaken by women. In order to help them, rainwater catchments will be constructed; this technology is known and accepted by the populations in similar conditions. As to excreta disposal, it will be improved by providing improved ventilated pit latrines. The main objectives of the project are to improve health, minimize the work of women, construct fifteen pilot rain water catchment facilities in each one of the two administrative centres, train some fifty craftsmen, give women responsibility for the management and maintenance of the works, introduce low costs WSS technologies at the level of schools and health posts and bring the populations to involve themselves fully in these activities and in their financing.

##### Institutional Framework. Time Table. Cost

The responsible government institution is the Direction of Hygiene and Sanitation (EHA) of the Ministry of Health, with support from CREPA. The other activities are as follows: preliminary surveys and information of the population, selection of craftsmen to be trained and identification of the sites, determination of community participation and on site availability of construction materials, technological choice based on socio-economic conditions, preference of the beneficiaries, and nature of the soil, information and education of the beneficiaries and training of local artisans and construction of works with support from CREPA. The training period will last 3 weeks for each session.

The duration of the project will be 18 months, and its cost will be about CFA Francs 25 million (US\$ 100 000), including 9 million for the construction of 20 rain water catchments and 40 latrines and 4 million for the construction of demonstration units including 5 rain water catchments and 5 latrines.

B/ TOGO

**Definition. Location. Description**

The objective of the project is to improve the water supply and sanitation conditions in 4 villages of the South of Togo (Adiva, Adina, Evou and Yao-Kope), with a total population of about 6000 people. The sites will be equipped with public fontaines, connected to the main network of Atakpame, and with dry pit ventilated latrines (VIP). These technical works will be accompanied by social activities, organization of village committees for the management of the works, health education.

**Justification. Objectives**

Problems related to drinking water supply are serious, both qualitatively (utilization of polluted surface waters) and quantitatively (the sources dry up during the dry season). The local population, which is mostly illiterate, has no knowledge of the fundamental bases of hygiene. There is currently no adequate infrastructure for sanitation.

**Objectives of the action**

- . To improve the quantity and quality of water resources: extension by 5.5 km of the network of chlorinated water which supplies Atakpame, and construction of 2 to 4 public fontains per village;
- . in order to combat the dissemination of excreta, provision of a latrine demonstration unit; construction of a 1 VIP 4 seats and 2 VIP at individual and village levels;
- . information to villages on notion of hygiene: health education;
- . organization of communities in order to increase and maintain knowledge and health equipments: organization and training of committees.

**Institutional framework. Implementation**

The connection to the main and the construction of the public stand posts will be carried out by the Togo National Water Authority (RNET). The sanitation activities (technological choice, management and training of local craftsmen) will be undertaken by CREPA. The health information and the organization of villages will be undertaken by a specialized Togolese organization.

**Duration. Costs. Beneficiaries**

The action will take at least 2 years. The total cost of the project is not known at this stage, but the RNET component of connection to the main, for which external funds are required, amounts to about CFA Francs 76 millions (US\$ 300 000). The beneficiaries are represented by the inhabitants of the 4 villages, say about 6000 people.

## PROJECT 8

### DEVELOPMENT AND IMPLEMENTATION OF

### WATER-SANITATION-HEALTH

### ACTION PLANS IN COUNTRIES IN GREATEST NEED

#### Justification and Objectives

The countries which are in greatest need of water supply and sanitation improvements are also the most severely constrained by lack of financial and human resources, and in many cases lack of water. As elements of the primary health care approach to Health for All, water supply and sanitation require the protection, conservation and preferential allocation of water resources, the use of appropriate and affordable technologies, improved operation and maintenance, and improved international coordination and cooperation, especially for the countries in greatest need.

However other elements which were often neglected in the past are gradually gaining recognition because they are regarded as essential to the sustainability of systems and the continuity of the services which they provide. These include sector planning and institutional development, health education, community participation including cost recovery from users, and full involvement of women.

The WHO Working Group on Water Sanitation and Health has issued several reports on water quality and sanitation improvements, health education, community development and health impact evaluation, essentially for francophone countries of the African and American regions. There is also an interest on the part of French-speaking Asian countries to join the programme. An initial action plan could involve the following countries:

- in Africa, countries of the Sahel (Benin, Burkina Faso and Mali), the West Africa Coast (Bénin and Togo) and Rwanda in East Africa;
- in America, Haiti;
- in Asia, Cambodia, Laos and Vietnam.

All these countries can benefit from health education and other materials produced in French; all of them are among the countries in greatest need of water and sanitation improvements.

The absence or inadequacy of water supply and sanitation facilities and services has two effects on health:

- a) disease
- b) poor health

The immediate objective of the proposed project is that WHO (CWS Unit) and other members of the Water-Sanitation-Health Working Group assist countries in the evaluation of these effects, the determination of water supply and sanitation improvements required and the identification and removal of constraints likely to hamper the development of water supply and sanitation facilities and services and the achievement of their health benefits.

#### Institutional Framework. Implementation

The activities will consist in assisting countries in undertaking "water-sanitation-health audits", in designing "plans of action" based on the findings of these audits and the availability of techniques and resources to effect required improvements and implementing these plans and monitoring their results.

- A/ The water-sanitation-health audit assesses the health effects of inadequate water supply and sanitation on the basis of two broad types of indicators:
- a) epidemiological indicators of diseases (their geographical and social distribution, incidence, prevalence);
  - b) socio-economic indicators of poor health, including for instance low coverage of water supply and sanitation needs, low income, low levels of community development and involvement in health-related activities: these indicators are indispensable complements to (a): mortality and morbidity in order to provide a sound and comprehensive basis for planning.

In addition, the water-sanitation-health audit assesses the country's capability to expand its on-going water supply and sanitation and all related health education and promotion programmes in order to achieve the required health improvements. The audit therefore includes the assessment of the major technical, organizational, managerial, financial, legal and resources constraints likely to hamper the development of these programmes and the achievement of their health benefits.

- B/ The water-sanitation-health plan is divided according to the types of water supply and sanitation developments most needed with respect to a) disease and b) poor health:
- a) technical support is provided to emergency relief operations required by serious epidemic outbreaks and to the preparation, implementation and monitoring of water supply and sanitation development plans to lower the endemicity of water related diseases;
  - b) technical support is provided in planning, implementation, monitoring and evaluation, in the fields of water resources management, water supply, wastewater disposal, stormwater drainage and solid wastes management, essentially in the following areas:
    - (i) - development, expansion and rehabilitation of facilities;
    - (ii) - operation and maintenance;
    - (iii) - hygiene education;
    - (iv) - environmental management for vector control;

- (v) - institutional development;
- (vi) - information networks and documentation.

The present proposal contains activities listed under A/ a) b) and B/ b) above, with emphasis on A/ for countries where too little data is yet available for planning water-sanitation-health interventions (e.g. Cambodia, Guinea Bissau, Haiti, Laos, Togo, Viet Nam) and on B/ b) (i), (iii), (v) and (vi) for countries which have on-going water-sanitation-health programmes (e.g. Benin, Burkina Faso, Mali, Rwanda) which require strengthening.

The countries of the first group require fact-findings missions, information/promotion workshops with national officials and preparation of water-sanitation-health action plans including recommendations on measures which necessitate early attention from government and support from external agencies.

The countries of the second group require strengthening of the hygiene education component of their programmes, including national institutional development to ensure sustainability, support to the development of appropriate water supply and sanitation technologies, and planning and coordination to integrate projects and other activities as warranted; these countries can also create reference centres in the water-sanitation-health field, for instance in the framework of the environmental health technology centres network in Africa.

The timing of activities will be determined according to the needs of countries or subregions, in consultation with the regional offices concerned and the main external agencies which support the programme. Regional sessions of specialized committees of the Water-Sanitation-Health Working Group will be organized to assist in the planning process.

WHO will act as facilitator of a process which is essentially guided by the recommendations of the WHO Water-Sanitation-Health Working Group:

- to promote water-sanitation-health approaches;
- to prepare water-sanitation-health audits and action plans;
- to assist in the implementation of these plans;
- to coordinate research and disseminate information.

These functions will be undertaken by WHO Regional Offices and Headquarters in answer to countries' requests. At Headquarters, the CWS Unit will have overall responsibility for the programme, which will be executed in consultation with other HQ Units with which CWS cooperates.

Other collaborating agencies and institutions are generally represented on the Working Group or cooperate with it. NGO's play an essential role, like the Association EAST (Eau, Agriculture et Santé en Milieu Tropical), as well as project units, like POCHEP (Poste Communautaire d'Hygiène et d'Eau Potable, Haiti), other international organizations like UNICEF, and bilateral, multilateral and international financing agencies like Swedish SIDA, GTZ/CAPRE/ANDESAPA or World Bank. EPFL and CREPA support the activities of the Working Group, especially by their studies and projects on low cost technologies.



## Budget

Budget \*  
(from July 1993 to December 1994 - US\$ 000)

Activities	Travel	Consultants	Document. Workshops	Total
Fact-find./plan. mis. (Togo, Asia countries)	20	20	20	60
Project formulation missions (Mali, Rwanda)	8	8	0	16
Support to on-going projects (Benin, Burkina Faso, Haiti)	16	30	30	76
Information and Training	<u>16</u>	<u>16</u>	<u>16</u>	<u>48</u>
TOTAL	60	74	66	200
Program. sup. costs (13%)	<u>7.8</u>	<u>9.6</u>	<u>8.6</u>	<u>26.0</u>
Total ext. funding req.	<u>67.8</u>	<u>83.6</u>	<u>74.6</u>	<u>226.0</u>

\* Not including WHO regular budget Costs (WHO staff costs, printing costs, miscellaneous).

## PROJECT 9

### BURKINA FASO

#### REFERENCE LABORATORY

Creation of a Reference Laboratory for the control of drinking water for Ouagadougou and 17 neighbouring villages.

#### Description. Implementation. Objective

The objective is to implement a permanent structure for the control of the quality of water for human consumption. This Reference Laboratory, located in the capital of Burkina Faso, will be placed under the responsibility of the Direction of Health Education and Sanitation (DESA). The surveillance will be exercised on the water of the network supplying the city of Ouagadougou and on the main source of supply of each one of the 17 neighbouring villages (less than 20 km).

The action will last for two years (from July 1993 to June 1995), subdivided in three periods:

- . a preliminary study, undertaken by EAST, will start the control of the potability of water. The results of its evaluation will serve to define a surveillance protocol adapted to the local conditions;
- . on this basis, the DESA laboratory, will be installed and equipped and will become operational;
- . the DESA will take responsibility for the surveillance of water, with technical support from EAST. During this last phase, the working methods will be tested, and the financial resources required for the operation of the Reference Laboratory will be estimated.

The training of national agents, in Ouagadougou and in France, will last two years. It includes the technical and practical aspects of analyses and personnel and supply management.

The control structure will be autonomous as soon as the programme ends. It will be funded from a specific budget, allocated to DESA by the Ministry.

By providing the Burkinabé authorities with a structure which can react rapidly and appropriately to pollution, the objective of the action is to improve the quality of the drinking water supply service. The final objective is therefore to provide the best possible protection to the users against waterborne diseases which have a high prevalence in the country.

The beneficiaries include the users of the water supply network of Ouagadougou and of the modern water points of the seventeen rural villages. The whole of this population amounts to more than 500 000 people. The equipment and responsibilities of DESA will increase, as they will include the management of water surveillance and control, while the qualitative efficiency of the agencies in charge of water supply will be improved.

### Institutional Framework

The DESA is the main institution concerned, and more specifically the staff of DESA who will work in the Reference Laboratory will be in charge of the continuous implementation of the project. The DESA is an important Direction of the Ministry of Health and Social Action, which has a centralized service and one or several representatives in all the Provincial Health Directions.

Since the beginning of its interventions in Burkina Faso, EAST has been working in relation with this institution, which is its most direct national counterpart. A close collaboration has materialized in the form of practical teaching by the EAST physicians and the support of DESA to the hygiene improvement works which the Association has undertaken.

The National Water and Sanitation Authority (ONEA), which is responsible for the treatment and distribution of drinking water to the city of Ouagadougou, is directly concerned through its water treatment, network maintenance and training services. The same applies to the village water supply agencies which ensure the maintenance of the boreholes in the seventeen rural villages.

It is planned to undertake a double study, both internal and external, at the end of the two years. Its objective will be to provide the elements required for preparing the surveillance protocol, measuring the effect of regular controls on the quality of water supplied, evaluating the adequacy of human and material resources utilized and establishing the provisional operational budget for the Reference Laboratory. The self evaluation is done by the personnel of DESA and EAST, who permanently participate in the project and supervise it, and it relies also on data provided by ONEA. The external evaluation is undertaken by a consultant specialized in drinking water quality surveillance.

### Budget

The total budget for the two years amounts to FF 2 443 000 (US\$ 500 000) and is broken down as follows:

	FF	%
Total cost	2 443 000	100
External contribution in cash	1 976 000	81
Local contribution	467 000	19

The local contribution is essentially represented by the cost of construction of the Reference Laboratory and by the salary of the personnel of DESA.

**WATER SUPPLY, SANITATION****AND HEALTH IN RURAL AREAS****ANNEX I****ANNEX I****WORKING GROUP ON WATER - SANITATION - HEALTH****LIST OF MEMBERS**

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**WATER SUPPLY, SANITATION  
AND HEALTH IN RURAL AREAS**

**ANNEX II**

**ANNEX II**

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**WATER SUPPLY, SANITATION  
AND HEALTH IN RURAL AREAS**

**ANNEX III**

**ANNEX III**

**HEALTH EDUCATION**

**IN DRINKING WATER SUPPLY AND SANITATION**

**by P. Empereur Bissonnet**

**I. JUSTIFICATION OF HEALTH EDUCATION**

**1.1 Present Situation**

The infectious diseases are among the main causes of morbidity and death in developing countries. More than half of them are due to the contamination of drinking water and food by fecal matters. Individual and collective behaviours are favourable to fecal oral disease transmission: dissemination of human and animal excreta on the ground, low level of individual and domestic hygiene, unprotected water sources, pollution of drinking water, food and containers etc.

In fact, this permanent fecal contamination of the human environment has a socio-cultural origin. The traditional rural societies, as well as most urban dwellers - formally peasants in more than half of the cases - are in total ignorance of the scientific bases of hygiene. The notions of microbes, transmissible infections or fecal peril are unknown. This does not mean that the concept of cleanliness does not exist, but it is related to religious, cultural or simply empirical references. It has nothing in common with the Pasteurian vision of infections, which has been at the origin of the modern practice of hygiene.

**1.2 Preventive Measures**

It is well known that the incidence and prevalence of water and excreta related communicable diseases are significantly reduced by the simultaneous implementation of three types of measures, which tend to improve the safety of the environment, the conditions of individual and domestic hygiene and the microbiological quality of water and food. The prophylaxis of some of these diseases - poliomyelitis, typhoid, cholera - is also based on vaccines which are not always very efficient (cholera).

These measures are typically preventive, in the sense that they tend to reduce the number of cases to the extent possible. By reducing mortality and morbidity, they have benefits corresponding to savings in costly and sometimes useless curative treatment.

Drinking water supply, hygiene and sanitation have largely demonstrated their efficiency for more than one century, in industrialized countries. The dissemination of health messages to entire populations, as a result of compulsory school attendance, has played an important role and remains essential in the field of prevention.

### 1.3 Developing Countries

Obviously, the situation of developing countries is largely the result of lack of financial and technical resources. The usual media of public teaching - schools, health care system, army, press - are quite insufficient; they are accessible to a few only, especially in rural area.

Development specialists have however shown very little interest in health education, at least until recently. This lack of interest was mostly prevalent among national officials, financing agencies, technical consulting firms and international cooperation agencies.

The dissemination of health education, a programme with long term impacts, has rarely been a priority. Both on the political arena and the development markets, the construction of new works (wells, boreholes, sewers) was given preference, the more so as the relevant techniques were better known and led to higher financial performance.

The emergency of village water supply programmes, motivated for instance by the current drought in West Africa, is also a reason which has contributed to giving preference to rapidly installed equipments, at the expenses of long term health education programmes.

To a large extent, this important deficiency accounts for the low health impact of many borehole drilling campaigns. These have led to the equipment of good quality water sources, without explaining to the users the benefits of potable water and how to avoid fecal pollution.

As a result of past failures, health education is currently gaining momentum. The programmes however remain limited and short lived. Constructions are led by hydrogeologists and civil engineers, without collaboration with health professionals, so that often the health education of users is neglected.

## II GENERAL STRATEGY

### 2.1 The Challenge

By motivating each individual to follow the rules with respect to prevention, to construct household equipments and to participate in the construction and

maintenance of communal works, health education has an effect on water quality, on personal and domestic hygiene and on the safety of the environment.

Beyond its main objective, health education also gives autonomy to local communities, and it therefore becomes sustainable. As a fundamental element of public health, it should associate to preventive medical measures social measures of public management and organization.

The implementation of a complete health education programme (HEP) goes therefore far beyond the framework of a few briefing sessions, which are often the limit of what can be expected in this field.

## 2.2 Guiding Principles

As it aims at motivating the target population to change ancestral behaviours, health education can only be conceived as a long term action. At best, it should be permanent.

In order to remedy the lack of equipment, personnel, and financial resources of the public administrations, the organization of HPE should adopt the primary health care approach; decentralization of responsibilities, through the organization of local management committees, and cost recovery from the population, are indispensable. Sanitation corresponds to the provision of facilities and know-how, while health education corresponds to knowledge. It is therefore logical that these two activities be undertaken by a common structure.

## 2.3 Objectives

### Final

To improve the health of the population by prevention of diseases related to lack of hygiene and pollution of the environment.

### Intermediate

- 1) With respect to the administration
  - to create or reinforce a specific service for HEP and sanitation;
  - to organize the support, supervision and training of local management staff.
- 2) With respect to local management (village or district committees)
  - to train public health educators and facilitators;
  - to train for the construction and maintenance of sanitary facilities;
  - to organize the financing and management of recoverable costs.
- 3) With respect to the population in general
  - to disseminate basic public health knowledge;
  - to promote behavioural changes corresponding to this new knowledge;
  - to disseminate technology know-how adapted to requirements;
  - to promote participation in kind, cash and labour.



## 2.4 Levels of Intervention

A sustainable global strategy for HEP would be defined at three levels:

### 1) Institutional

HEP should be placed under the responsibility of a specific administration under the authority of the Ministry of Health, which would include Health Education and Sanitation.

This Direction would be responsible for the design, implementation, follow-up and evaluation of programmes to be undertaken. It would have autonomous resources in personnel, supplies and equipments.

It would coordinate and harmonize all activities in its field of competence; it would therefore work in close relationship with the other administrations (Education, Water, Public Works), the development agencies and the NGOs.

The staff of the provincial or departmental Directions of Health should include one representative of the Direction of Health Education and Sanitation. The equipment could include a kit for bacteriological analyses and dosage of residual chlorine, follow-up sheets, teaching aides and a few construction tools. It would supervise the district nurses and teachers who facilitate the work of the local committees. It is often useful to suggest that the knowledge of the civil servants responsible for follow-up be updated through specific sessions.

The main themes are included all along the primary and secondary school curriculum. HEP is already taught in classes, but it remains superficial and it often requires improvements. The teachers' training schools provide the teachers with a summary knowledge of this discipline.

Prevention methods should also be disseminated at the level of health care structures, elementary schools or training centres, and during the military service.

The terms of reference of radio and television channels should include health education programmes.

### 2) Communal

The vesting of some responsibilities with local authorities implies that a Health Education and Sanitation Committee (HESC) should be created in each urban district or rural village.

Its role is to represent the interest of the community, to liaise with the administration, to organize and advise individuals, to manage the facilities available to the community and to continue the HEP.

The HCSC includes members of the water point committee (president, pump maintenance agent, hygienist and treasurer) and some other responsible persons:

- an HEP agent, who is normally the community health agent;
- a drinking water agent, who is responsible for chlorination of water;
- a sanitation agent, who should also be an experienced mason.

At the beginning of the programme, these people receive training, both general and specific to each function. The committee is provided with equipment to ensure the autonomy of its action: teaching supports in the form of guidelines, which include elements of training and teaching aids to facilitate the HEP meetings.

According to the importance of the tasks for which they are responsible, the members of the HCSC can be remunerated or not; they can be remunerated for specific tasks (masons), or they can be paid employees (agents in charge of chlorination and daily supply of water to the community).

The operating costs (including salaries) are covered by the beneficiaries. Whenever local resources are available, the creation of economic production units (agriculture, handicrafts, stock raising) should be encouraged as their benefits can result in decreases in recurrent costs.

### 3) Individual

Each individual represents the final target; the objective is to change his or her behaviour with respect to diseases. This involvement in an active, daily, individual and community oriented prevention programme will change the habits, and also result in financial costs.

HEP is rendered even more difficult by the fact that the health benefits of preventive actions in water supply and sanitation are not immediately perceived. Moreover, the knowledge of ways to avoid infectious diseases is rarely the subject of a demand from a public which is not conscious of risks.

It is therefore necessary to support and maintain the health education efforts in order to encourage the users to adopt the preventive measures and cover their cost. It is always useful to remind the unwilling chiefs of households that the expenditures are finally much less than the cost of treatment, the lost of human lives and the incapacity to work.

### 2.5 Target Populations

The whole of the population is concerned. However, a special effort is warranted in rural regions which are often neglected, and which have the higher illiteracy rates (school attendance rates of less than 50%).

Two groups should receive special attention:

- women who are socially responsible for the household water supply and the education of the children;

- children at school, future chiefs of households who are currently in an environment favourable to the acquisition of knowledge.

Urban dwellers should of course have access to HEP, especially the inhabitants of those urban poor areas which are the most subject to urban pollution and the least educated.

### III CONTENTS AND TEACHING METHODS

They are constantly questioned and subject to changes. Some health education sessions are like university courses in tropical parasitology. In fact, the messages should contain the mere basic notions which will facilitate the understanding of preventive measures:

- the existence of microbes and their effects on health;
- the mode of transmission of the main water-related diseases (diarrhoeas, poliomyelitis, dracunculosis, schistosomiasis, hepatitis);
- the ways to break the cycles: protection of water points and surroundings of boreholes, concentration of excreta in latrines, specialization of food containers, disinfection of water supplies, simple rules of personal and domestic hygiene etc.

The theoretical teaching emphasizes the role of excreta and the need to ensure their safe disposal. The utilization of disinfecting products (soap, chlorine), available at low cost, should be promoted. The protection measures should also be combined ; besides, they should be sustainable on a daily basis, and promote community oriented action.

Since it aims at introducing new habits, education should primarily be practical. As much as possible, the emphasis should be on the demonstration to the participants of concrete gestures to be reproduced: washing hands and containers with soap, chlorination of water in the households etc. Community participation in public latrine construction or in the equipment of water points, and the model behaviour of local management personnel, are also elements which can motivate and which should be relied on. Teaching by examples is one of the best ways to obtain new habits, if their usefulness has been clearly explained.

At last the facilitation should be an interactive process. It constantly requires responses from the public and it underlines the positive points, helps the audience to find appropriate solutions and concrete decisions to be taken at the end of the sessions. It is preferable for instance to rely on some existing practices (like in the Muslin religious culture) than to ignore all traditions.

In parallel with health education, meetings should be held on the local management of preventive action. After the initial contact with the community, the constitution of a committee of local officials is envisaged. During the meetings, the exchange of information and the discussions will achieve the following:

- clarification of the objectives of the action and of the functions of the committee;
- participation of the public in works of collective interests;
- sensitization of the public to the financial implication of the programme;
- selection of a method of cost recovery.

#### IV TEACHING EQUIPMENTS

There is sometimes a competition in technology which leads to the adoption of sophisticated audiovisual materials. These equipments break easily, their cost is high, they require sometimes difficult maintenance and specific logistic conditions (cars, energy for teaching equipments, dark rooms for the projection of films), and there are often inadequate for the environment where they will be used.

The teaching approach, the authority and the talent of the facilitator, the willingness of the population to learn are success factors at least as important as the technology used.

The speech itself (discussions on themes, songs, role playing, etc.) is an important aid; it represents the unique way to transmit knowledge in some societies. The teaching equipment should be simple, understandable by the illiterate who are not used to visual symbols; the use of modern equipment should be sometime discouraged, as the participants' attention is attracted by the technical features of the equipment rather than the content of the message. The teaching equipment is the working tool of a large number of educators (administrative agents, local management personnel) and it should therefore be inexpensive and replicable.

In rural areas, where villages are often of difficult access and deprived of electricity, drawings are sufficient in most cases: flanellographs, posters etc. They show scenes of the current life which are rapidly recognized and illustrate simple and logical presentations. They meet all selection criteria: low procurement and maintenance costs, replicability, easy transport, solidity, independence from energy sources, rapid installation and simple utilization.

Modern audio visual techniques (slides, films) are recommended for the training of management staff and technicians responsible for follow-up. They can be discussed when the education concerns older pupils, with whom documents of the "Child to Child" type can also be used.

In urban areas, oral aids and pictogrammes can also be used. The urban dwellers are generally better educated, the meeting places are of easier access than in rural areas, electricity and closed meeting rooms are available, so that modern equipments can be used in urban districts. Besides, media campaigns can remind the audience of messages given during HEP meetings. The dissemination of the same message through various channels - meetings in districts, posters, radio and television broadcastings, articles in the press - is perceived more consciously and by more people.

The contents of the training programmes for the managers of the administration and for the local personnel should be summarized in a teaching guide. This should be given to each participant at the end of the session, and it should include a text, some drawings and plans of sanitary equipment, accounting tables etc. Similarly, the pupils find in their school books (on Natural Sciences), the notions learnt during the sanitation sessions.

## V PRACTICAL IMPLEMENTATION

The programme starts with an initial study. This will lead to the identification of the social environment, the constraints and the gaps and the adaptation of the teaching materials. This basis is also required for the breakdown of resources to be used.

The health education personnel undertake to organize and train the committees. They facilitate the first meetings of HEP/management and the construction of the initial equipments.

The HEP takes place on the sites where its beneficiaries live. The dynamism and the sense of organization of the local managers should be mobilized in order to ensure that the meetings are attended by most families, with a large participation of women. In the cases where women can not express themselves well in the presence of men, it may be necessary to organize separate meetings.

It is generally easy to reach the target groups in towns, because the population is concentrated, the literacy rate is high and there are numerous possibilities of disseminating information. In rural areas, some constraints (agriculture, celebrations, funerals etc.) should be taken into consideration when preparing the time table of the HEP meetings.

At the end of the programme, a survey should be undertaken, in the same conditions as the initial survey, in order this time to prepare a critical evaluation and to provide orientations for the following actions.

A campaign of health education lasts several years. There should be three or four events per year in each target group. Rather than multiply the advice, it is always better to repeat the same messages regularly.

## VI EVALUATION

The evaluation is indispensable as a part of the decision making and rational judgement processes, since it measures the effect of a health programme by comparison with the objectives adopted.

The elements of the evaluation are the dissemination of the intervention and its health impact, but also its acceptability by the population and its economical and social consequences. The evaluation is based on statistical comparisons. An analysis is required, which will show whether there is a difference between the results of the survey, and establishes a causal linkage between the measured effect and the action undertaken. The methodology should be very rigorous, even if the conditions of an experimental study as required to demonstrate causal linkages are nearly impossible to meet in developing countries.

The collection of data is made through services, questionnaires and observations, sometimes with biological analyses and clinical examination. The consultation of the books of the health care centers is possible, but they often provide incomplete or erroneous data which affect the quality of the interpretation.

The criteria of judgement for an HEP campaign, taking into account the resources used and the objectives adopted, are as follows:

- the state of health knowledge (assimilation of education messages);
- the follow-up of hygiene practices and the definite adoption of new equipment;
- the investment and operating costs (economic feasibility);
- the reduction of mortality and morbidity (health impact).

The state of health is difficult to appreciate by objective criteria. Indirect data can be obtained by interviews. The study of the bacteriological quality of drinking water stored in the household (number of total and fecal coliforms/100ml) is a valid element, also indirect, to evaluate the follow-up and the validity of the advice given.

## VII CONCLUSION

One of the main public health issues in developing countries is represented by infectious diseases. They are largely related to the permanent fecal pollution of the human environment.

The lack of individual and domestic hygiene and the pollution of the environment are largely due to the ignorance of the populations and their low economic potential. The lack of interest of decision makers for health education also seems to have contributed to the present situation.

It is possible to diminish at low cost the importance of the infectious diseases. This requires significant efforts in the field of prevention such as access to water supply and individual and collective hygiene. The health education of the population is absolutely essential in this process.

The harmonization and sustainability of these actions require the reinforcement or creation of services of Health Education and Sanitation, the implementation of local structures and the recovery of costs from the beneficiaries.

**WATER SUPPLY, SANITATION  
AND HEALTH IN RURAL AREAS**

**ANNEX IV**

**ANNEX IV**

**THE SELF-HELP APPROACH IN FINANCIAL COOPERATION**

**by S. König\***

This paper is about the role and the basic concept of the self-help approach (SH) in Financial Cooperation.

The principles of promotion illustrate the necessity of and the benefit from self-help oriented actions by giving examples from financial cooperation projects, and indicate the preconditions for a successful application of the self-help approach in drinking water projects.

The design guidelines for self-help oriented projects of financial cooperation provide the donor with concrete suggestions on appropriate actions and procedures required for implementing the principles of promotion. These guidelines follow typical possible interventions during the programme cycle and restrict themselves to self-help aspects. They are useful only when applied in accordance with the principles of promotion.

The principles of promotion and the design guidelines are based on experience gained in projects in rural and peri-urban water supply. The majority of case studies are projects in sub-Saharan Africa (and) with executing agencies having only marginal experience in direct cooperation with poverty groups. The principles and guidelines established for rural water supply projects are to a large extent applicable to target-group oriented projects in other areas. They reflect the present state of experience and may have to be modified in light of future experience in this field.

In the past, the understanding of the self-help approach was often limited to the physical cooperation of the target group during the implementation phase. The results of the analysis, however, have shown that the most important phase of self-help oriented projects within financial cooperation is the stage of designing and preparing projects.

Problems later tend to arise (e.g. the project facilities are not regarded by the beneficiaries as their own concern, operation and maintenance thus being

\* Article sent by KfW (Kreditanstalt für Wiederaufbau) after the third consultation of the Working Group. Some of the ideas expressed verbally by the author are developed.

neglected) if the principles of self-help are not sufficiently taken into consideration during the preparatory stage. Although useful conclusions can then still be drawn for the designing of future projects, it is very difficult during subsequent project phases to remedy what was neglected during the planning phase. From the point of view of financing and executing agencies, cooperation with non-governmental organizations promoting self-help may be desirable since the activities and experience of governmental and non-governmental organizations can complement each other. Such a cooperation may also be advantageous to non-governmental executing agencies, since considerable obstacles outside their scope of influence or financing possibilities may hinder the success of their projects.

The desired transfer of responsibility and decision-making towards self-help based structures makes it difficult for external planners to design project measures in advance. Frequently, detailed technical planning is not required since the projects are technically simple, such as village wells or small buildings. In these cases, the necessary details should be decided by or in close cooperation with the beneficiaries during implementation. Greater emphasis has to be put on the participation of the people concerned and on the implementation process. The organization of processes - in particular the linkages between social, technical and logistical processes is of utmost importance and requires a timely and precise definition of the overall conditions. These include the choice of technology (what technology is to be applied ?), nature and extent of contributions to be provided by the population and, above all, the capacity of the governmental executing agencies involved and the capacity as well as the freedom of action of the non-governmental organizations and of the self-help structures of the population. All this requires an increased degree of communication, as well as care in dealing with organizations and people often unexperienced with such forms of cooperation.



**PRINCIPLES OF PROMOTION FOR SELF-HELP ORIENTED PROJECTS  
OF FINANCIAL COOPERATION - ILLUSTRATED BY THE EXAMPLE OF  
RURAL DRINKING WATER SUPPLY**

1. Voluntary participation in the project.
2. Goals and expectations of the population concerned and of the planners are identical.
3. There is a consensus among the concerned parties about their respective rights and duties.
4. The design of the project is adapted to the financial/organization/technical capacities and the living environment of the concerned population.
5. The beneficiaries, organized in communities/user groups, may make their own suggestions for solving problems and take their own decisions (people concerned as active partners).
6. Developmental initiatives from the people concerned originally not included in the planned project may be adopted.

The principles of promotion (see box above) are no rigid prescriptions, but should as thought-provoking impulses help in conceptualizing projects. To be put into practice, they need to be embodied in the working method of the executing agency and possible further partners of cooperation.

On the subject of relative importance of and the intrinsic relation between the six principles, it may be said that the first four principles are necessary conditions for realizing the fifth principle ("people concerned as active partners"). The sixth principle ("Developmental initiatives from the people concerned ..."), plays a secondary part in ensuring the success of the project itself, although it may serve to diversify and consolidate the desired social process and be important for achieving its sustained effect.

#### METHODOLOGICAL SUGGESTIONS:

In open self-help oriented programmes - just like in other target-group oriented projects - the willingness, the capacity and the heterogeneity of the population concerned determine the success of the project. But the self-help approach in large area programmes providing decentralized facilities requires a specific methodic way of dealing with these factors, which can be summarized as follows:

- detailed sociological surveys concerning the subjective conditions in the micro-locations of the programme area are usually not required;
- the existing situation, resources, consciousness, felt needs and potentials of the people concerned are evaluated on the basis of secondary information and of reference projects (past performance), as far as possible;
- the project design resulting from field survey has to define realistic overall conditions for promotion based on the actual sectoral and regional conditions (above all, objective selection criteria such as availability of raw water, service deficits, ecological carrying capacity, accessibility for transport, as well as minimum requirements regarding the necessary contributions to be provided by the people concerned in order to ensure a sustainable operation of the facilities).
- advance contributions provided by the communities/user groups during implementation (and before physical works) reveal which micro-locations fulfil the minimum requirements regarding the willingness, the capacity and the social cohesion of the population and therefore can be expected to succeed, and which locations cannot be included in the promotion on the basis of the same criteria (self-targeting mechanism). The anticipation by external planners of the subjective conditions for success at the level of micro-locations is therefore largely replaced by exchange with and decisions by the people during implementation. This process requires good catalytic communicators in the project team during implementation.

**WATER SUPPLY, SANITATION  
AND HEALTH IN RURAL AREAS**

**ANNEX V**

**ANNEX V**

**PREVENTION OF DIARRHOEAL DISEASES**

**KEY HYGIENE BEHAVIOURS**

- a. Sanitary disposal of faeces, with emphasis on:
  - (1) faeces of young children and babies;
  - (2) people with diarrhoea.
- b. Handwashing\*, at least:
  - (1) after defecation;
  - (2) after handling babies faeces;
  - (3) before preparing food;
  - (4) and before feeding and eating.
- c. Maintaining drinking water free from faecal contamination (in the home and at the source);
- d. Feeding small children with recently cooked or recooked food.

\* Research indicates that hands must be washed with soap, mud or ashes to be free of faecal contamination. Washing with water alone is not sufficient.

Source: Report of an Informal Consultation on Interventions to improve water-related Hygiene Behaviour (Geneva, 18-20 May 1992, preliminary draft).

## WATER SUPPLY, SANITATION

### AND HEALTH IN RURAL AREAS

### ANNEX VI

#### ANNEX VI

#### CHLORINATION\*

by Bernard Verhille

#### Treatment Requirements for Potable Water Supplies

The sequence of steps is as follows: screening (to eliminate the largest solids), settling - clarification (elimination of mud from water) and various chemical treatments:

- destruction of toxic chemical products,
- flocculation (chemical products accelerate the settling of the more resistant suspended solids - Al or Fe salts, polyelectrolytes);
- major disinfection with chlorine or ozone;
- remanent disinfection with chlorine.

Various combinations of these techniques are used according to the nature of the water, which can be obtained from a spring, naturally filtrated by soil, or a running surface water (a river), or a static body of surface water, like a pond. In some cases, the major disinfection is done without efficient flocculation, can result in the creation of toxic molecules (polyhalogated organic compounds with chlorine, peroxides and aldehydes with ozone).

The remanent disinfection is due to the  $Cl O^-$  ion; this process is called chlorination. Major disinfection should be applied to all cases, except for efficiently controlled borehole water. When the process of chlorination is used for major disinfection, subsequent remanent chlorination is not required.

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\* Presentation on the Industrial Environment of Water Treatment by Chlorination - Sté des Produits Chimiques d'Harbonnières - April 1991. Presentation at the second consultation of the WHO Working Group on Water-Sanitation-Health, Geneva, 9-11 April 1991 (WHO/CWS/91.5)

## Chlorine in the Economy

More than half of the turnover of the chemical businesses in some countries (among the most industrialized) is linked to chlorine. Chlorine is made as a co-product of soda, and with it, constitutes an essential basis of the world chemical industry.

The largest chlorine/soda plants produce 1 million tons of chlorine per year, the smaller ones can produce a few hundred tons per year only. A minimum feasible unit should produce 1000 to 2000 T/year. The mineral products concerned are essentially:

- soda for textiles and detergents;
- hydrochloric acid for cotton;
- ferric chloride for flocculation;
- liquid chlorine;
- sodium hypochlorite;
- bleaching powder (chlorine of lime).

Local production plants of chlorine and soda are always the starting-off point of basic chemical industry. Too few countries in the developing world have this type of plant. In North Africa Algeria, Egypt, Lybia and Morocco produce chlorine.

## Action and Effects of Chlorine

Chlorine acts in water in the form of the hypochlorite ion  $Cl O^-$ . This ion can be brought by various products:

- gaz chlorine;
- sodium hypochlorite (bleaching solution);
- calcium hypochlorite in the form of bleaching powder of HTH;
- sodium isochlorocyanurate;
- chlorinated tri-soda phosphate (CTP).

When a certain concentration of this ion is dissolved in water, as it is a very active oxydating agent, it will:

- destruct the organic molecules which are sensitive to its action, fats, dies, etc.;
- store itself in the suspended humic and carbonic matters, and produce chloramines and chloro-phenols;
- if there is an excess of free chlorine, the  $Cl O^-$  ion penetrates in the living cells, destroys some of their elements, and makes these cells burst.
- it destroys also mycoses, parasites and viruses.

The destruction function by chlorine of some organic molecules is used for bleaching, and killing viruses, which can live a long time in liquid matters, even in water. The capacity to penetrate the cell and to make it burst is used in the disinfecting function for bacteria, parasites and mycosis.

By contrast with these two positive uses of a very active ion, one also finds unfortunately the natural degradation of the solution, and in the case of turbid waters, the formation of chloramines, chloro-phenols...

These are at the origin of the "smell of chlorine" which is often objected to. The chlorine stored in these suspended matters has negative effects, because:

- chloramines have very little disinfecting power (about 10 times less than the  $\text{Cl O}^-$  ion);
- the smell of chlorine (in drinking water as well as in swimming pools) is generally objected to by the public.

It is important to know that if there are chloramines, and therefore if there is a "smell of chlorine", there is in fact no free chlorine present. When the chlorine content of water containing chloramines is increased, a breaking point is reached where the suspended matters are saturated; at that time, all the chloramines free their chlorine, and the "smell of chlorine" disappears.

As far as the conservation of sodium hypochlorite solution is concerned, it should be noted that the degradation of this product will vary according to its quality, its concentration, the quality of the recipient, and climatic conditions. In identical concentrations:

- product degradation occurs much more rapidly at higher temperatures;
- an ill-adapted recipient can also cause very rapid product degradation.

It seems that in tropical climates, like in Brazil for "agua sanitaria", the concentration should be about 25 g/l (8 chlorometric degrees). It would be interesting to standardize this concentration for all countries as an intermediate product for the protection of potable water in rural areas.

In order to monitor the quality of the product and of the recipient, since product degradation occurs it is absolutely necessary to use an indicator (in France, the loss of 1/6 of the Javel water at 15° c, takes a maximum of 3 months for an initial concentration of 150 g/l, 48° Chl). In tropical countries, a possible indicator could be the time taken to lose 1/6 of the active product at 25g/l at 30° C (about one year).

The degradation occurs as the result of an initial loss called "oxygen loss", followed by a continuous loss called "chlorate loss", it is important to separate the two phases, while maintaining the product in the storage recipient during the degradation test.

Finally, the stability of the hypochlorite depends on a minimum content of free soda, approximately 0.4% for a product at 150g/l; the product should not be in an acid medium. Ventilation of the product destroys the free soda in the form of sodium carbonate. Excessive content of free soda makes the solution dangerous to handle. Free soda is particularly difficult to dose.

#### Conclusions

- a) Hypochlorite ion is essential for the remanent disinfection after flocculation of drinking water;
- b) Public health authorities should normalize its use:
  - the liquid raw material for chlorination, "water medicine", should be at a normalized content of 25 g free chlorine/litre;
  - the speed of decomposition must be normalized;
  - the content of free chlorine in drinking water must be 1g/m<sup>3</sup>, after flocculation.
- c) Production of hypochlorite can be integrated in basic industrial development as in Morocco (Mohammedia plant) or be undertaken with very limited investment by private bleach solution producers, as in Burkina Faso.

**WATER SUPPLY, SANITATION**

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**ANNEX VII**

**ANNEX VII**

**CONTINUOUS DISINFECTION OF FRESH WATER SOURCES**

**AUTONOMOUS SOLAR ENERGY DISINFECTION UNIT**

**by G. Guérin**

This technology has been developed during the last few years, especially in Africa, in order to provide a simple, accurate and reliable method of chlorination which can be adapted to any existing process of water abstraction in tropical rural areas. In many cases, the water abstracted by boreholes equipped with motor or hand-driven pumps is contaminated after its abstraction.

The chlorination system, thus developed provides for the delivery of quantities of javel water based on rate of active chlorine residual, measured after treatment. The injection of javel water takes place directly in the main; it is regulated by a meter corresponding to quantities of 50 to 5000 l/h. Any volume of water flowing from the station will be treated with the three defined quantities in order to avoid any risk of lack or excess of disinfecting agent. The system is entirely autonomous, operated by solar energy, and perfectly adapted to the need of isolated dwellings, hamlets and villages.

Javel water, even in small quantities, is a powerful disinfecting agent; it is known for its capacity to destroy all pathogens (bacteria, viruses, microbes, amaeboa, parasites and algae), which are normally present in raw water. If the chlorination is sufficient, the remanent effect of the residual chlorine guarantees an efficient protection of the treated water against the pathogens which are involuntarily introduced during transport to the household or during storage.

This chlorination system, which has been controled by Institut Pasteur in Paris, has been found both conceptually and technically satisfactory. The utilization of Javel water at 12° CHL ready for use is recommended, in order both to avoid the handling of raw javel water and to ensure better storage conditions without any chance of degradation.

Besides, preliminary studies in the United States have shown that the problem of high iron contents of the water of some wells or boreholes could be solved by treatment of the wells with chlorine in quantities of 2 to 7 mg/l in order to eliminate iron, and even manganese, as chlorine also prevents the development of ferro bacteria.

Finally, with respect to iodine, the results of analyses made in May 1992 have shown that there is no significant difference in iodine content in the presence of active chlorine; the process of iodization which is described elsewhere in this report can easily be integrated to the various systems of disinfection proposed above, without any additional technical investment.

## RESEARCH ON THE CONTINUOUS CHLORINATION OF RAIN WATER

by Maiga Fatoumata Socona

This article has been prepared by the Ministry of Public Health and Social Affairs of Mali, National Direction of Public Hygiene and Sanitation, and the CREPA antenna in Mali.

The objective is to study the conditions of improvement and maintenance of the quality of rain water through chlorination, by comparing various methods of disinfection (continuous chlorination from various distribution units, intermittent chlorination) in order to identify those methods which are the most appropriate and efficient in rural areas and should therefore be disseminated.

The equipment consists essentially in an eight to ten litres clay jar which is made locally, simple or with double walls. The parameters to be monitored are the demand for chlorine, the pH, the fecal coliforms and the residual chlorine.

The preliminary study took place in Sikeroni, which is one of the most densely populated districts of Bamako, where people rely entirely on rain water for their supplies. Fifteen wells were selected on the basis of the following criteria: the source should be perennial, the protection walls should be sufficiently high, the well should be adequately located in terms of distance from the pollution sources, it should be safe in terms of protection, surveillance and sanitation. The yields have been measured and water has been abstracted to determine the rate of absorption of chlorine. The required quantities of javel water and lime were then determined for those wells which would be part of the experiment.

Among the selected wells, five received javel water, five had pre-chlorination followed by continuous chlorination, and the other five had continuous chlorination. The measures of residual chlorine have shown that: rainwater treatment by continuous chlorination after pre-chlorination provides residual chlorine during four weeks, at rates which vary from 4 mg/l after one hour to 0,1 mg/l after four weeks of treatment, simple chlorination provides residual chlorine during 2 weeks and traces after twenty days; in the case of the main addition of Javel water, the disinfecting agent disappears after four days.

It can be concluded that continuous disinfection preceded by pre-chlorination is much more efficient than the other disinfection techniques. The treatment cost is FCFA 5 460 for a ten meter deep well. The cost can be lower if the population participates in the supply of local materials such as sand, gravel, ropes or jars.



**WATER SUPPLY, SANITATION**

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**ANNEX VIII**

**ANNEX VIII**

**EVALUATION OF THE HEALTH IMPACT**

**OF THE CONSUMPTION OF CHLORINATED WATER**

**IN RURAL AREAS IN AFRICA\***

**Description and Objectives**

Eau, Agriculture et Santé en milieu Tropical (EAST/Water, Agriculture and Health in Tropical Areas), has undertaken since 1988 an intersectoral development programme based on the drinking water-health relationship, with a target population of thousands of school children in rural areas. A longitudinal study will be carried out over 1 year to evaluate the health impact of the consumption of chlorinated water by this population.

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.

**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 socio-cultural 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 consume at home is not treated;

\* Source - EAST - Presentation made at the first consultation of the WHO Working Group on Water, Sanitation and Health, Geneva 27-28 June 1990 (WHO/CWS/90.12).

- 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 meets 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 diarrheas, 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 for viruses is not envisaged in the framework of this study, because it is too complex and costly.

#### 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.

**WATER SUPPLY, SANITATION**

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**ANNEX IX**

**ANNEX IX**

**IODIZATION\***

**by A. Blanchard**

**and C.P. Pusineri**

**The Health of Children in the World\*\***

The following objectives are included in the list adopted by the World Summit for Children of 30/09/90 in New York:

- in general: access of all families to safe water supply and sanitation;
- nutrition: nearly total elimination of the affections resulting from lack of vitamine A and iodine.

**Effects of Iodine Deficiency**

Several hundred million people have an insufficient supply of iodine. The high prevalence areas are: Africa (essentially landlocked countries), Latin America and Asia (in its center, especially in China).

The pathological consequences are extremely serious:

- during pregnancy: spontaneous abortion, premature delivery, foetal death, foetal brain development disorders;
- in children: mental retardation, abnormal psychomotor development, growth disorders, muscular disorders, paralysis, language and hearing disorders, cretinism;
- in adults: goitre, adynamia, cretinism, low productivity.

\* "L'Eau Nouvelle Source d'Iode - Rhodiffuse Iode " (Water New Source of Iodine), and "Troubles dus à la Carence en Iode" (Affections resulting from Lack of Iodine) - Rhône-Poulenc Rover, 1990.

\*\* United Nations Children Fund (UNICEF), 1990.

All these consequences have an impact on the economic life, as most of the people affected are virtually excluded from the active community.

There are many ways of providing humans with iodine, like the iodization of salt, intramuscular injection of iodized oil, or oral absorption of iodized oil. These methods are not fully satisfactory, because they require costly resources and they are difficult to implement in practice; besides, usually only a minority of people in developing countries can benefit from these improvements.

#### Problem Definition

Endemic goitre, evidenced by the enlargement of the thyroid gland, was until recently considered to be only a secondary problem with no repercussions on general health. Advances in medical sciences have completely modified our perception of this issue to the extent that the reduction of iodine deficiency disorders has now become a priority for the international authorities.

Certain countries are privileged by particular dietary customs or a specific geographical situation enabling them to effectively combat iodine deficiencies. These advantages are not the same everywhere. The natural soil iodine content, leached away during glaciation or erosion, affects the diet of the populations. It is therefore difficult for people in such geochemical contexts to escape from iodine deficiency disorders. Regular and sustained attention is required for the prevention and control of deficiencies.

For the correct treatment of these disorders, a medical infrastructure is usually required, the first concern of which is to detect symptoms. Treatment must then be ensured within the framework of locally available means. What solution can be proposed? What industrial perspectives may be put forward to ideally answer this problem affecting more than 800 million people, a figure which was confirmed by the last United Nations coordination report? The irreversible nature of iodine deficiency in children has led the international authorities to consider this health problem as a world-wide priority, and the scientific community has decided to address it as a matter of urgency.

#### Proposed Solution

The main feature of the proposed solution consists in a system which ensures the programmed release of iodine through silicone polymers which can release continuously during one year in wells and boreholes or any other water point or water tank. This system provides for continuous treatment of the people who suffer from iodine deficiency, by using the most universal, physiological medium, water.

The notion of biological acceptability is fundamental, and therefore silicone polymers have been selected, because they are biotolerated. Their physical, chemical and biological properties correspond to the objective. The source of iodine selected is sodium iodine, which is an iodine salt of high quality which is widely available.

The prototype has the following characteristics:

- a daily iodine supply of 50 to 200 ug/l per person for a consumption estimated at about 2 liters of water per day;
- for a borehole yield of 600 l/hour;
- for an average operation of 12 h/day.

The parameters affecting the diffusion of the iodine salt are:

- the distribution of the iodine salt;
- the type of iodine salt;
- the type of silicone elastomere;
- the degree of cross leaking of the silicone;
- the initial percentage of iodine salt;
- the surface area/volume ratio of the matrix.

The diffusion process is as follows: the diffusion of water through the matrix towards the hydrophilic salt, continuously transports and releases the iodine by induced osmosis. The osmotic pressure gradually breaks the matrix network leading to the new osmotic contact and so on. The system (physiological system) consists in a polyethylene module containing N "matrices" (cylinders) which are silicone polymers imprisoning a defined proportion (30%) of sodium iodine, and which have the surface/volume ratio selected to allow for utilization during one year.

Mali has been selected for field testing of the experimental data, because it is a landlocked African country, with more than 2 million cases of chronic lack of iodine (source - WHO). The geographical area selected is in the North West of Bamako, with goitre affecting 42% to 64% of men and 58% to 83% of women.

The study started in December 1988 on the diffusion of iodine in water under daily conditions of use in African countries, to demonstrate the correlation between the supply of iodine in water and urinary excretion, to check the acceptability among the population of a device inserted into a borehole and to follow-up with surveillance of chemical and goitre indices.

The experiment was carried out in three villages sufficiently far apart to prevent any zone effect; a control village was used as a control group during three months; water was supplied from a borehole. The programme was conducted in full agreement with local authorities and mores, with controls by water assays twice per month, assay of urine every three months, and permanent clinical follow up.

**WATER SUPPLY, SANITATION****AND HEALTH IN RURAL AREAS****ANNEX X****ANNEX X****RURAL WATER SUPPLY TREATMENT\***

**by M. Wegelin**

The slide sound show presented at the consultation concerns essentially water treatment processes applicable to turbid surface water. Groundwater, which should be given preference when it is available, is usually free from contamination, and therefore needs little or no treatment. The most difficult component to operate and maintain in a water supply system is water treatment. Therefore, the use of surface water should only be opted for after careful consideration of the other alternatives.

The main objective of any water treatment is the removal or destruction of the microorganisms affecting the health of the consumers.

Slow sand filtration and chlorination are treatment processes primarily used for the separation and oxidation of microorganisms. Slow sand filters improve the bacteriological water quality on the basis of natural, physical and biochemical treatment processes. They make maximum use of local resources, they hardly require mechanical equipment and do not depend on chemicals; their operation is easy and reliable. However, slow sand filters perform well only with water of low turbidity. The same applies to chlorination, which is often applied as final treatment step to destroy the microorganisms and provide a safety barrier against the subsequent microbiological pollution of the water. Chlorination requires careful dosage of the chemicals.

Most flowing surface waters are turbid, especially during the raining season. High turbidity surface water should be treated in two stages:

- to reduce the turbidity by the removal of the solids from the water;

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\* Abstracts from the slide sound show of the World Bank sub-module 4-5-b presently under production (International Reference Centre for Waste Disposal, UNDP World Bank Project, 1991).

- to remove or destroy the microorganisms remaining in the pretreated water, by slow sand filtration or chlorination.

Flocculation and sedimentation are used as a first treatment step to remove the fine solid matter, in large municipal water treatment plants. The following constraints apply more specifically to the rural areas:

- water treatment requires chemicals, which are often imported and difficult to transport and store in the quantity required;
- chemical water treatment requires dosing equipment; the doses should be adapted to rural water quality, or the installation may be damaged;
- chemical water treatment requires skilled personnel, which is difficult to find in rural areas, for monitoring of the water quality, adjustment of the doses, maintenance and repair.

These constraints are especially serious in the frequent case of management of the facilities by the community, alternative treatment processes must be used, based on physical and biological, rather than chemical properties, by analogy with the natural treatment of ground water, which undergoes efficient natural purification processes.

Floating matters are removed by sedimentation tanks, roughing filters and various other filters installed next to the catchment; where the hydraulic head is sufficient, dynamic filters can be installed in river beds.

The removal of suspended solids is usually followed by treatment to improve the bacteriological quality of water, by slow sand filtration and chlorination.

Generally, rural water supply treatment presents a challenge for all people involved, especially in the case of high turbidity surface water. Our main counterpart is nature itself, which provides the best model for the production of a clean and bacteriologically safe water.

**WATER SUPPLY, SANITATION**

**AND HEALTH IN RURAL AREAS**

**ANNEX XI**

**ANNEX XI**

**PRESENT SITUATION OF WSS IN RURAL AREAS\***

**by L. Laugeri and L. Monjour**

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. 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.

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\* Abstracts from the Report of the First Consultation of the WHO Working Group on Water, Sanitation and Health, Geneva, 27-28 June 1990 (Document WHO/CWS/90.12)



To-day, while more than 1000 million people are still without water, the beneficiaries of the service 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 by the prevalence of bacterial, viral and parasitoid infections. In the absence of adequate sanitation, water also plays a role in the transmission of schistosomiasis, amebiasis, filariasis and other diseases which affect nearly one billion people. Besides, millions of people are still infected by the Guinea worm. Waterborne infections are particularly serious among malnourished children. Worldwide, water used for drinking purposes is at origin of the death of several million children per year.

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.