IRCWD NEWS

WHO International Reference Centre for Wastes Disposal

Ueberlandstrasse 133, CH-8600 Duebendorf/Switzerland

"IRCWD News" is issued on the sole responsibility of the WHO International Reference Centre for Wastes Disposal; it does not necessarily reflect the official views and policies of the World Health Organization

No. 18/19 December 1983

Community Water Supply and Sanitation Programme of the Western Development Region of Nepal

Thousands of development workers from industrialized countries are engaged in development programmes and work alongside an even greater number of national staff. Some foreign personnel go on working in the development field over long periods of time. However, most of the non-nationals who return home after a few years of development activity, leave the development field and take up jobs geared towards the needs and situation of their (industrialized) countries.

A lot of experience is thereby "lost", not to the individual but to others interested in the matter, since relatively little is written and made available to a wider public about the work and circumstances "at the front".

The following article is thought as a contribution to fill this gap. **Martin Strauss** *who worked in Nepal's Community Water Supply and Sanitation Programme from 1979 – 1982 reports in detail about the institutional set-up and implementation of the Programme. In the second part of his article, he focuses and reflects on aspects of project maintenance and durability, subjects which have become central issues in so many development programmes around the world.*

Introduction

This report tries to give the reader an insight into an ongoing field programme in community water supply and sanitation (CWSS), highlight achievements and setbacks, and draw a number of conclusions.

Under contract with SATA, the author was seconded to His Majesty's Government (HMG) of Nepal, i.e. to its Western Development Region (WDR) CWSS Programme from 1979 to 1982. After working as a field engineer and thereby receiving field "initiation", he was in charge of technical programme management which comprises planning, budgeting, conceptual design, coordination, liaisons and overall supervision of the Programme and its components.

Programme implementation is a joint undertaking of HMG's implementing agency (regional level) administrative and technical staff, the benefiting communities and a small number of expatriate engineers who are also members of staff of the regional administrative unit. The Programme receives further support from UNICEF (construction material, training, manpower).

The views expressed in this article, particularly those regarding the relationship between project durability and the pace and way of implementation, are subjective by their nature and open to debate. Any development project or programme is a highly complex undertaking with "open ends". Accordingly, implementation and success (i.e. long-term benefits to any group) depend on many inputs, factors and boundary conditions. Below, only a very few of these aspects are picked out and elaborated. Therefore, the analysis presented should only be regarded as fractional.

What is reported herein is how a westerner has experienced the Programme's work and how, with an "industrialized" educational and cultural background, and "short-term" insight into Nepal's culture and history, he is now looking at things in retrospect.

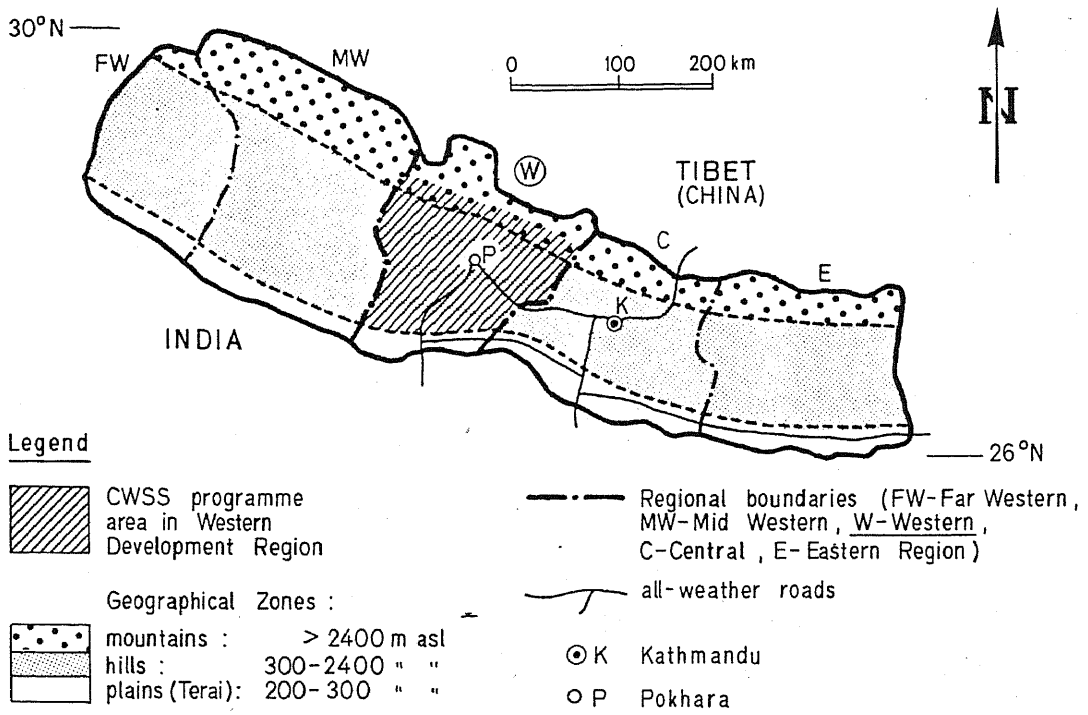
The views and experience of those who carry out an important part of the development work, the Nepali field personnel, and those who are meant to be the beneficiaries, the villagers, who also carry out another important part of the work, are hardly ever heard, in fact they are almost always totally ignored. Thus, another big gap needs to be filled . . .

A recent issue of **Waterlines** gives an account of another non-governmental community water supply and sanitation programme in the process of being implemented in the hill area of Nepal's Western Development Region[1]. A comparsion of this programme with the one described below should be most interesting and initiate further thinking and debating on the implementation of CWSS programmes.

[1] J.R. Williamson, Towards Community-Managed Drinking Water Schemes in Nepal, **Waterlines,** Vol. 2, No. 2, Oct. 1983.

Geography and Administrative Structure of Nepal and its Western Development Region

(see also map)



The Hindu Kingdom of Nepal encompasses a total area of 140 000 km^2 and a population of 14 million (1980) whose growth rate is 2.3% per annum, of which 95% live in rural areas. Topographically, the country is divided from south to north into three distinct zones: the Terai (forming the northern part of the Ganges plain), the Hills and the Mountains which include the Himalaya range. Geographical data of these three topographical zones are given in Table 1.

Table 1:
Geographical Data

Zone	Height a.s.l. (m)	Area (km^2)	Av. Precipitation (mm/a)	Population 1980 (mill.)
Terai	300	20 000	1500–2500	5.3
Hills	300–2400	75 000	1000–3000	7.3
Mountains	2400–8800	45 000	500–3000	1.4
Total		140 000		14

Administratively, Nepal is structured from west to east into five Development Regions (DR), each extending from the country's southern to its northern borders (see map). The DR are further divided into Zones and Districts. The smallest administrative units are the village councils ("Panchayats"). Table 2 shows the number of administrative units of the country and Western Development Region, respectively.

Table 2:
Administrative Set-up of the Country and the Western Development Region, Respectively

Admin. unit	Country	Western Dev't. Region
Dev't. Region	5	–
Zone	14	3
District	75	16
Village Council	approx. 4000	approx. 800

The Community Water Supply and Sanitation (CWSS) Programme described in this article covers essentially 13 Districts (out of 16) of the Western Development Region, all located in the hill and mountainous zones. The Programme area extends over 23 000 km^2 and comprises a rural population of 2.1 million (1980).

Transportation links in Western DR as throughout Nepal are mainly made of foot trails and mule tracks. There are also 500 km of all-weather roads.

The Agencies and Benefiting Communities; their Role in CWSS Programme Implementation

The Ministry of Panchayat and Local Development (MPLD) with its offices at regional and district level is the executing agency for the country's rural CWSS programmes. The responsibilities of the different levels are summarized in Table 3.

The government of Nepal receives since 1972 external support (grants-in-aid and manpower assistance) for its CWSS programme from **UNICEF,** which in turn solicits support from **other multilateral and bilateral donor agencies** (SATA for example provides grants and technical manpower for the CWSS programme in the Western Development Region since 1976).

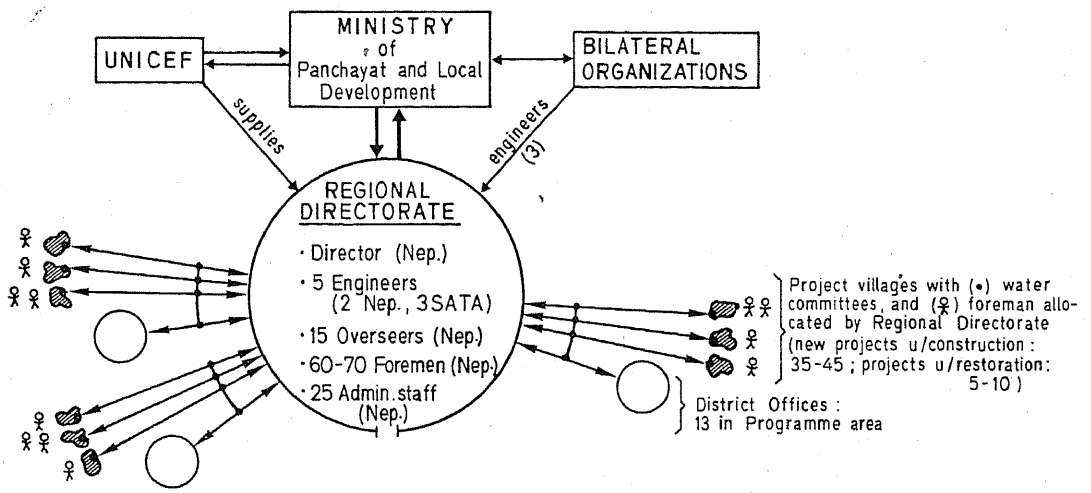
The **benefiting community** is involved through all project stages, namely with the preparation, construction, operation, and maintenance. Its participation is catered for by an elected village committee which is in close contact with the Regional Office field staff. A project is carried out upon the community's request which is often initiated and represented by an influential villager or a high ranking official.

The various bodies involved in CWSS programme implementation and the way they are linked together are described in Fig. 1. Particular reference is made to the Western Regional Programme.

Table 3:
Responsibilities of MPLD and its Regional and District Offices

Central office	– formulation of the implementation policy in the local development sector (including CWSS) – long-term planning and setting of yearly targets for regional CWSS programmes – allocation of funds to Regional programmes upon receipt from Ministry of Finance – approval of project proposals submitted by the regional offices – formulation of the administrative procedures – assignment of staff to the regional and district offices
Regional offices	– yearly project survey and construction management plans – project preparation, construction, and restoration (a "joint venture" with benefiting communities) – support activities such as procurement of supplies, transport, manpower development and project standardization
District offices	– channeling project requests from villages to the regional offices – disbursing government funds to benefiting communities in remuneration of part of their labour contributions.

Fig. 1:
Organizational Set-Up and Investment Cost of the CWSS Programme (Western Development Region)



SHARING OF INVESTMENT COST

- Nepal government : 15 - 20 %
- Villagers (equivalent): 15 - 20 %
- Donor agencies : 60 - 70 %

OVERALL INVESTMENTS IN W. REGION

- Total 1982 - 85 : US $ 4 mill. approx.
- Per design capita : US $ 40 approx.

Programme Components

Improvement of people's health is generally considered the major objective for embarking on CWSS programmes. In working towards this goal, the prime objective in terms of **"hardware"** is the implementation of village water supply schemes and latrines for village schools and families. Physical structures alone, however, do not suffice to bring about health improvements. If people are to accept new water supplies and latrines and change their traditional sanitation habits, **"software"** becomes as important as "hardware". Table 4 shows the major hard and software activities of the WDR's CWSS Programme.

Table 4:
"Hard" and "Software" Components of the CWSS Programme in WDR

"Hardware" (construction)[1]	**"Software"**
– New water supply schemes – Restoration of previously completed water supply schemes – Latrines for schools and families – Ferrocement development for storage tanks	– Training: · Basic skills for foremen · Foremen refresher and communication courses · Village maintenance worker training · Sanitation, health education – Sanitation promotion: · Design and construction of demonstration latrines · Production of educational material – Design and construction standardization – Establishing effective maintenance – Amending and adapting administrative implementation procedures – Liaison and communication activities

[1] including project surveying, design and costing, scheduling and supervision; stores + transport management

Construction Programme in Water Supply

Magnitude of the task

As mentioned above, the regional offices of the MPLD handle CWSS programmes in villages with a typical population ranging between 300 and 2500 inhabitants. According to rural population projections for the year 1990, the number of schemes of that size needed to attain full coverage may be estimated at approximately 1700 for the Western Development Region. These numbers are in considerable contrast to the previous and present output of the Programme (see Table 5). The figures show that, in terms of hardware requirements, the task of water supply development in rural Nepal is in fact tremendous.

Table 5:
Quantity Aspects of the Western Development Region's CWSS Programme[1]

Item	No. of new water supply schemes	population served[2]	% of Programme area (hill) population served
– Completed between 1971 and 1982	150	150,000	7%
– Current capacity output per year	15–20	15–20,000	+0.7–+1%
– Estimated output till 1990 (at present or slightly increasing rate)	+150–200	+150–200,000	+10%
– If **46%** coverage of the 1990 population is to be achieved (Decade target)	+700	+700,000	46%
– If **100%** coverage of the 1990 population is to be achieved	+1,700	+1,700,000	100%

[1] based on the following population 1980: 1.5 million
1990: 1.9 million
[2] based on an average per-project-population of 1000 inhabitants

Programmes of the scope of Nepal's rural water supply and sanitation programme entail strengthening, expansion and, in certain situations, even the creation of local and central institutions. These implementing agencies carry out ever increasing development programmes which comprise a growing demand for continuous operation, maintenance and restoration of schemes, formation of trained manpower, monitoring and evaluation and many other tasks. **Institution building** is therefore an important secondary objective of any development programme. Its proper recognition influences a programme's scope and the approach chosen for programme implementation.

Unfortunately, during national and international target-oriented planning and programming of development schemes (e.g., 5-year plans, Decade planning) there is a tendency to undervalue the crucial role of software components and institution building. The pragmatic approach which assigns first priority to meeting quantitative targets and suggests that the "rest" be dealt with "later", will in the long run endanger the potential developmental effects of a programme.

Hardware output being but **one** component of the Programme, the magnitude of the task is further increased if consideration is given to:

– the need for restoration of broken-down systems and continued support for system maintenance (52% of WDR's CWSS schemes completed prior to 1981 have been found to "have major defects" or to be "non-functional"),

– the need for complementary software inputs such as health education, evaluation, monitoring, technology development, without which the success rating of the quantitative output will remain low,

– institutional development and enhancement of administrative efficiency to cope with the tasks lying ahead, and

– economic aspects such as adequate allocation of funds for investment as well as operation, maintenance and restoration.

Technical characteristics of schemes

All systems constructed by WDR's (and other region's hill programmes) CWSS Programme are gravity-fed schemes typically comprising:

- a spring or stream catchment
- a supply main of 2–3 km length to the reservoir site
- a reservoir tank with 15–20 m^3 holding capacity
- a branched distribution system of 3–4 km length serving 10–15 public tapstands (depending on the number of people to be served and on the settlement pattern)
- appurtenances such as break pressure devices, air, washout and branch valves.

The time required for construction usually extends over two construction seasons of 7–8 months each.

Structures are made from stone-cement masonry. Polyethylene or, where burying is not possible, galvanized iron are the pipe materials used. Five standard pipe diameters ranging from 20 mm (1/2") to 90 mm (3") and two pressure classes are used.

Project design population of schemes implemented in recent years in the WDR has increased steadily from about 1000 in 1977 to 2000 in 1981/82. Pipe length per system has increased from around 2 km to 6 km. The trend towards larger systems is difficult to explain. However, a possible explanation might be the Programme's growing popularity and, as a result of changes in water regimes due to deforestation, a growing dependency of neighbouring communities on perennial sources of sufficient yield and appropriate catchment development. Furthermore, experience has shown that unless villages which border a project area are not integrated into the planned or under-construction-project, they might be deprived of one of their traditional sources or of the only source which could be used at a later stage for an own piped supply.

Project implementation procedure

Project requests reach the Regional Office either through district authorities (with a recommended priority ranking), or through liaison activities between local and national level politicians and administrators. Due to limitations in the capacity of the regional implementation agency (budgetary constraints, limitations of supplies, lack of actively involved engineering manpower and administrative problems), and depending on the importance of the project, it may take from two to four years for a requested project to materialize. Each year, before the onset of the monsoon rains, a tentative **construction programme** for the forthcoming construction season is drawn up. Based on this programme, a number of **feasibility surveys** are undertaken by technical field personnel in close contact with the beneficiaries. Most of the springs and streams exhibit low or lowest flow conditions at this time of the year. Project feasibility is then based on a number of **criteria** such as source yield, savings in water fetching time, perceived community interest, source quality, source dispute, cost per capita, and other non-technical aspects. Feasible projects call for a **detailed survey** whose purpose is the collection of desigh data, further communication between the community and the implementation agency, and the final siting of structures. During the monsoon rains, project **designs,** bills of quantities and cost estimates are prepared. **Construction** starts after the rice harvest, i.e. at a time when villagers are available for non-farming work. After some preliminary work carried out by farmers (gathering of stones and sand), **construction material** such as cement, pipes, fittings and tools will be transported from the Regional Office to the villages. The material which is trucked to the nearest road-head is then carried by villagers to the site. This work takes from one to four days, occasionally up to eight days. Ideally, construction proceeds "from top to bottom", i.e. from the catchment to the reservoir and distribution system.

The most important part of the work such as reservoir construction and mains laying can therefore be carried out when communal enthusiasm and combined efforts are still high. The required enthusiasm and cooperation from village fractions for the construction of branch lines and tapstands will be relatively easy to motivate once water is nearing **"their"** tapstand. Further supply of material from the Regional Office will depend on the requirements and progress of work at the site.

Upon project completion, the village is requested to establish a **maintenance committee** which is to control activities of the **village maintenance worker,** cater for his remuneration in cash or kind and for liaison with the Regional Office in case technical support is necessary.

The Regional Office receives funds as periodical installments from the central government to cover regular expenses (including village dues). Funds for remuneration of village skilled workers and village "carriers" are then distributed by the Regional Office to the respective district authorities, which in turn will make payments to the village water committee upon presentation of bills which have been signed by the committee chairman, the foreman and the overseer. Finally, wages will be paid to the villagers by the committee chairman.

Technical Manpower

During project preparation and construction, close and regular **communication** exists between the community (or its representative body, the water committee) and the Regional Office, notably its field staff. CWSS field staff are grouped into **foremen, overseers** (supervisors) and **field engineers.** The Programme's **"extension workers"** (one or two foremen) live in the particular project village for the duration of project construction. Their task consists in assisting and guiding the villagers in the construction, managing village labour in close contact with the water committee, training and guiding skilled village workers and the project caretaker on the job, promoting health education, and stimulating the interest and sense of responsibility of villagers for the long-term care of the scheme. His terms of reference are thus most challenging and therefore, much of the Programme's training effort is spent on enhancing his "tool box".

Overseers who are in charge of three to five projects pay regular visits to the sites. They guide and consult the foremen and the village committees in technical and organizational matters and administrative procedures. They assist in the provision of supplies from the regional centre to the village. Their professional formation and field experience makes them best suited to participate in project surveying, design and costing.

Field engineers whose responsibility encompasses 10—15 projects in a number of districts, cater for design and costing, supplies logistics, and handle complementary programme tasks such as maintenance management, training, sanitation development and standardization.

The Regional Office disposes of extensive **stores** for stocking all items necessary for project construction, including donor (UNICEF) provided material such as pipes, cement, fittings and special tools, as well as HMG funded material such as tools and complementary construction material. Any indigenous material such as stones, gravel, sand, and timber is provided by the benefiting community.

Project cost

The average project investment cost in 1981/82 included:

- overall project cost: approx. NC[1] 250/design capita
  (" US$ 20/ " ")
- thereof
  - donor (UNICEF) contribution[2]: 55% approx.
  - HMG contribution[3]: 25% approx.
  - village equivalent contribution[4]: 20% approx.

[1] NC = Nepali Currency (Rupee); 1 NC = 0.08 US$; programme
[2] overhead and technical staff salaries excluded
[3] comprises pipes, cement, fittings, tools
[4] comprises locally purchased material, remuneration for village skilled labour, carriage, vehicle transport
comprises equivalent cost of indigenous material, trench digging, unskilled labour

Major determining factors for per-capita project cost are the settlement pattern, the distance between the source and consumption area (which determines pipe length) and the ratio of the source yield and projected demand (which determines the reservoir capacity).

Performance of Completed Systems

From 135 systems completed by 1981, 45 have been visited and closely examined as regards their condition and construction finish, as well as the suitability of material choice and project design. Village maintenance arrangements and their impact have also been evaluated in order to create a rational basis for the formulation and implementation of a regional project maintenance scheme. Briefly, the evaluation of projects revealed that a great number of schemes had partially or completely broken-down, many had hardly ever been operational at all, and numerous projects had not or only inadequately been maintained. The following statistics (Table 6) highlight this phenomenon.

Table 6:
Condition of water supply schemes

Item	Condition "serious shortcomings"[1]	(% of schemes evaluated) "non-operational"[2]
1. **Evaluation of system components**		
— catchment	47%	20%
— reservoirs	42%	5%
— break pressure installations	36%	23%
— valving	38%	31%
— pipes	24%	11%
— tapstands	27%	20%
2. **Overall rating**	36%	16%

[1] beyond villagers' repair capabilities
[2] requiring partial or complete reconstruction of schemes

In 1976, **standardized** design, construction and administration of projects had been introduced in the WDR's CWSS Programme. Foreman and caretaker training had also been made a permanent component of the Programme. This rendered projects easier to maintain for villagers, and reduced seriousness of defects as shown in Table 7.

Table 7:
Repair necessities and causes of defects in water supply schemes

Item	% of schemes evaluated: non-standardized projects (prior to 1976)	standardized projects (after 1976)[1]	all projects
1. **Repair necessity**			
· None	1%	12%	8%
· Minor (village level)	17%	53%	38%
· Major	42%	32%	36%
· Restoration	40%	3%	18%
2. **Causes of defects**			
· inadequate design	44%	15%	27%
· inadequate construction	89%	70%	78%
· natural disasters	11%	11%	11%

[1] has to be attributed to the fact that the standardized schemes are of younger age than the non-standardized ones which, to some extent, contributes to the better rating of standardized schemes.

Although 2/3 of project villages had appointed a village maintenance worker, hardly any preventive maintenance was provided. Remuneration of the caretaker by the village (in cash or kind) had no marked effect on actual maintenance performance. Causes of project damages or shortcomings and need for maintenance range in the following order of importance: shortcomings in construction (choice of material, construction finish, incomplete construction), inadequate preventive maintenance, ignorance and negligence, design deficiencies, malicious damage, natural disasters.

Taking both old (non-standardized) and new (standardized) projects, the Programme's success rating based on system viability is only about 50%, i.e. half of the systems require major repairs or restoration.

However, if non-standardized and standardized projects are rated separately, a substantial improvement can be noted: project "wastage" was reduced from approximately 80% to 35%. The improvement in project performance is based on project design and construction standardization (which also renders projects more easily maintainable by villagers) and on foremen training which has been greatly intensified in the past few years. The basis is thus set for further improvements and for the realization of lasting benefits. In addition, the Regional Office has started to assist communities in system repairs and restoration by allocating supplies, funds and manpower.

In the long run, adequate project viability may be achieved mainly if three objectives are aimed at[1]:

(1) Gearing the implementing agency's technical and non-technical capacity and capabilities in order to achieve maximum **construction quality** and system maintainability.

(2) Strengthening village capability and promoting community interest and **awareness for preventive project maintenance** throughout the phases of a project.

(3) Integrating into the Regional Office, a **maintenance section** which will be allocated an adequate budget and manpower and which will cater for repair work and restoration support to communities.

In-House Training

Training constitutes a major Programme component and thus one of the backbones of the Programme. Below, the training activities are listed in a summarized form:

Course designation	Major subjects handled	No. of participants/a	Purpose
Foreman basic and upgrading training (incl. 6–8 months pract. training)	· basic arithmetics · water sources · system components · masonry & plumbing skills · health education incl. latrine construction · plan reading & setting-out · site management & community liaison · field work alongside experienced foremen	20–25	formation of the Programme's project foremen, their task partly that of extension workers
Village maintenance workers[2]	· system components and their functions · typical maintenance & repair tasks; checking & reporting · masonry & plumbing · latrine construction	20–30	training of motivated or assigned villagers to cater for operation, preventive maintenance, minor repairs, and reporting to Regional Office

[1] for more detailed information, see paragraph on "Unsatisfactory project durability: features, causes and consequences".

[2] called for formal training upon completion of "their" project; prior to this, on-the-job formation during project construction is aimed at.

Foreman refresher courses have been introduced in recent years in order to broaden professional knowledge, refresh basic skills and analyze and assimilate field experience:

Course designation	Major subjects handled	No. of participants/a	Purpose
Foreman refresher course	· foremen's field experience, feedback & terms of reference · communication skills, role playing · health education & promotion · improving basic skills and construction finish · ferrocement construction	20–25	to receive feedback, to improve project implementation procedures & community liaison, to improve construction quality

Courses are mainly guided and taught by Programme field staff (supervisors, engineers). Strong support is provided by UNICEF communications staff and a local health educator.

Training expenses in 1981–82, covering participants' food and lodging at the government training institute, training material, teaching allowances, travel fares and miscellaneous items, amounted to NC 36 (US$ 3) per participant-man-day. Programme-related training may therefore be considered a truly cost-effective undertaking!

Health Promotion and Latrine Construction

Justification for a strong sanitation component may best be illustrated by the following statistics on the health status in Nepal[1] (in parentheses: figures for industrialized countries):

- out of 1,000 new born, 130–170 (8–40) die before the age of one;
- the mortality rate is 22 per 1000 (10);
- 50% of all deaths occur among children before the age of five;
- 30% of deaths among children between the age of 0–5 years are caused by a lack of proper sanitation, i.e. mainly due to transmission of gastro-intestinal diseases;
- 30–40% of the children admitted to health posts and hospitals suffer from diseases caused by a lack of proper sanitation;
- prevalence of worm infection is high, i.e.:
  1–11% among children of 1 year
  10–80% among children of 1–5 years
  20–100% among children of 5 years

A survey in a number of towns in central Nepal showed that 40–100% of adults suffered from worm infection.

[1] comparable figures are also applicable to other developing countries.

It is assumed that if strong emphasis is placed on sanitation, it will greatly contribute to alleviate the unsatisfactory health situation which, to a large extent, is caused by a lack of proper hygiene and sanitation. Consequently, programme activities in sanitation aim at three major objectives:

1) Create awareness among users of improved water supply schemes for **increased water availability and use** in order to improve personal and domestic hygiene; i.e. to stress also the **quantitative** rather than the qualitative (drinking) aspect of water only [1]

2) Arouse the interest of the population for the installation and use of latrines.

3) Promote primarily among field personnel the understanding of diseases, disease transmission and the role of improved water supply, latrines and improved hygiene for the purpose of curbing morbidity and mortality.

Sanitation "software" (excreta/water/health relationship, community liaison and health education), and **"hardware"** (latrine construction techniques) are included in training courses conducted by the Regional Office for which training material has been developed. UNICEF, in close cooperation with Regional Office staff, has started to introduce a **school sanitation curriculum** and teachers sanitation guide for overseers and foremen. Field staff are then supposed to guide teachers in their respective project villages in the teaching and practicing of sanitation at village schools.

Sanitation training activities and promotional material aim at familiarizing the trainees with:

- the basics of disease-causing organisms,
- communicable diseases, their sources, routes and causes of transmission,
- the role of proper use of water supply and latrines in preventing disease transmission which will ultimately lead to health improvements,
- the construction of simple but safe and attractive latrines,
- skills in communicating effectively and establishing contact with villagers for the purpose of basic health education,
- understanding the villagers' perception of disease and their reasons for traditional sanitation practices.

[1] it may be hypothesized that in many if not most locations in developing countries, where the need for improved water supply arises, an increase of the water **quantity** for bathing and washing is more important than an improvement of the water quality for consumption if the objective of health improvement is to be attained. The motto of the Decade should therefore read: "Water for Washing, Bathing and Drinking" rather than just "Water for Drinking"!

Development and promotion of improved (ventilated) pit latrines for village schools and individual families was added as an integrated component to the water supply construction programme. A number of foremen and overseers have effectively motivated villagers to construct and use latrines both for individual families and schools. Foremen are strongly encouraged to assist in the construction of at least one **family pit latrine** for use of their own and their village host family, from which a demonstration effect is expected to radiate. Demand from communities for school latrine systems is progressively increasing, probably as a result of crowded school yards where excreta can no longer be disposed of in a satisfactory manner. Communal latrines are not taken into consideration for rural communities.

In the promotion of pit latrines for schools and families, emphasis is placed on structural safety, prevention of smells and insect breeding, and ease in maintenance. All latrines are equipped with vent pipes of appropriate material. Single-pit latrines are presently considered more appropriate for rural Nepal than alternating-pit schemes, as the use of latrines for defecation constitutes a new practice for most communities. Single-pit systems are assumed to be easier and safer to operate than alternating-pit latrines. It is also assumed that the lifetime of the pit is sufficiently long for villagers or pupils to adopt this new method of excreta disposal, and thus be motivated to build a new latrine.

School latrines are designed as single-pit latrines with the pit extending beyond the latrine building. Pits are lined with dry stone masonry where necessary; the squatting and pit covering slabs are constructed from ferrocement on the site. The vent pipe (Ø/110 mm) is from polyethylene (the pipe material used in water supply projects). The typical pit volume is approximately 6 m^3, allowing for a 2–3 year pit lifetime if used by 70–100 pupils (yearly sludge accumulation based on 0.02 m^3/pupil). As soon as a pit is full, a new one has to be installed with partial re-use of material from the first latrine. The cost of the first few school latrines set up in 1981–82 amounted to NC 5000 (US $ 400) per unit serving 70–100 pupils, or NC 50–70 (US $ 4–6) per pupil, respectively. This includes material, labour, foremen's salaries, transport and village equivalent contributions.

Typical **family latrines** of 1 m width and 2.5 m depth (depending mainly on soil conditions) have a lifetime of 4–6 years for a 7-member family. Particular efforts have been made towards finding satisfactory construction material and methods for setting up **improved family pit latrines from exclusively local material.** Pilot units (both with rectangular as well as spiral-shaped superstructure, the latter without a door) with bamboo/stone slab squatting plates, bamboo superstructure and bamboo vent pipes have been constructed. In the latter, the internal membranes of bamboo poles were pierced with a front-sharpened 1 1/2" GI-pipe. The probably limited structural durability of bamboo in the humid micro-climate is what has kept field staff from widely promoting bamboo supported squatting slabs (collapse of a single squatting plate may ruin much of the success gained in a sanitation programme!).

Unsatisfactory Project Durability: Features, Causes and Consequences

Since its initiation, the CWSS Programme has steadily gained strength both qualitatively and quantitatively. Maintenance and restoration, though still modest in their scope, as well as sanitation, have acquired the status of integrated Programme components. Competent teams of field and extension personnel as well as supporting services (stores, transport) and administrative staff carry out the task of programme implementation. In spite of being relatively successful, some shortcomings in the Programme have become apparent, particularly the lack of project durability and the relatively high rate of system break-downs and need for partial or complete restoration (see also "Performance of Completed Systems"). The major deficiencies are summarized as follows:

(a) technical:
- improper catchment arrangements causing insufficiency in system flow
- leakages in catchment and reservoir structures caused by improper masonry work
- low structural strength of tapstands and ancillary structures
- improper tapstand drainage
- pipe exposure above ground due to improper pipe-laying
- shortcomings in system hydraulics (air blockage, flow insufficiency in branch lines).

(b) administrative, socio-cultural:
- project handed over incomplete to community, thus rendering systems susceptible to deficiencies and damage
- lack of village maintenance arrangement
- intentional damaging by villagers (often due to unresolved water disputes or lack of understanding of system operation).

The two groups of listed deficiencies are to some extent interrelated.

In an attempt to determine the **causes or influencing variables for system failures and deficiencies,** a wide range of factors and boundary conditions, and the environment of the Programme as a whole, are to be considered. The different aspects and variables listed below are, according to the author, particularly crucial in WDR's CWSS Programme implementation. Thereby, the **programme's implementing (field) staff** may classify the variables and boundary conditions either as **controllable, influenceable or appreciable.**[1]

variable, boundary conditions	controllable by impl. staff	influenceable by impl. staff	only appreciable by impl. staff
– HMG development policy and priority setting (role of CWSS programmes in national development plan, centralized vs. decentralized administrative structure)			x
– local funding[2] (overall appropriation, itemization, administrative handling)		(x)	x
– personnel management (staff assignment, rotation, career development)		(x)	x
– administrative procedures and flexibility relating to project implementation	(x)	x	x
– HMG inter-agency communication link		(x)	x
– community environment (socio-cultural, implicit or explicit need for improved water supply, water source dispute situation)			x
– community's understanding of and interest/participation in project benefits and implementation		x	x
– community/agency liaison	x	x	x
– community's farming schedule, climatic factors			x
– technical difficulties as related to natural site conditions			x
– project selection	(x)	x	x
– programme volume (no. of projects in process)	(x)	x	x
– availability of technical and non-technical expertise among programme staff.		x	
– logistic, technical and general support to field staff by programme supervisory and management staff	x	(x)	x
– frequency and scheduling of construction supervision tours	x	(x)	x
– competence in construction supervision	x	x	
– quality and content of in-house training	x	(x)	(x)
– supplies (suitability of material, availability, stocking)	x	(x)	(x)
– intercultural relationship between national staff/gov't officials and non-national staff	x	x	x

These factors and boundary conditions are interdependent. All of them influence directly or indirectly project implementation, construction finish, project operation and maintenance, and therefore the lifetime of the system itself. The listing shows that only half of the **influencing factors** are amenable to some kind of direct control by implementing (field) staff. Efforts are under way to improve a number of these variables in order to strengthen system viability. As regards the **appreciable elements,**

[1] some of these variables and boundary conditions fall under two or even three of the mentioned categories. This implies that the respective elements may be divided into subelements each of which fall under a different category.

[2] programme investment and recurrent cost covered by HMG.

most of them are related to socio-cultural aspects, government high level policy, ecological, environmental and climatic conditions. They are therefore beyond the control or influence of implementing field staff.

According to the author, it would be of major importance to limit the **programme's volume** (i.e. rate of project implementation) and targets to a feasible level. Although this might seem contradictory to the Decade's goals, it is probably the single, most effective Programme parameter which, if under proper control, can create the basis for long-term success. A "feasible programme volume" is a volume which allows for:

- careful project preparation (both technically and in terms of community liaison)
- intensive project supervision, as well as staff and project support
- extensive community liaison
- development of community understanding of the project and its implications
- administrative and logistic capacity of the implementing office to be in accordance with field and other Programme activities (procedural matters, transfer of funds, vehicle maintenance, stores handling, material transport)
- expansion of training activities to strengthen field personnel's "tool box"
- project maintenance activities to be raised to a level (from 10–20% of CWSS new-projects-development-budget) which will allow systems to bring about long-lasting benefits
- expansion of health education and sanitation promotion activities.

Furthermore, in restricting the volume of project implementation, it may allow project **follow-up** and **monitoring** activities to become integrated programme components with adequate allocations of funds and manpower.

All the activities and tasks stipulated above will necessarily be **at the expense of programme volume** since they require a great deal of time, manpower, and funds[1]. Unless and until such a Programme policy is adopted (when a consensus among the involved agencies is reached), taps will stop delivering water within a few years, latrines will stay unused or will collapse, community acceptance of projects and improved sanitation will remain low, and the tremendous efforts now being made by the benefiting communities, local government agencies and donor institutions, will be wasted to a large extent. Communities will be disillusioned and health improvements, **the** objective of CWSS work, will hardly ever be reached. Thus, in order to attain the Decade's long-term qualitative and quantitative goals of providing access to improved water supply and sanitation for all, field programmes (such as the WDR CWSS Programme) should be limited to a "safe" volume, while major emphasis should be placed on the qualitative components cited above. This will then probably increase community acceptance, system viability and lifetime, and thus create the basis for and the realization of lasting health improvements.

It is hoped that this article will encourage others to also share their experience and reflections with the large number of persons interested in development work. Comments concerning this article should be addressed to: **Martin Strauss, IRCWD, Ueberlandstrasse 133, CH-8600 Dubendorf, Switzerland.**

[1] it is assumed that both internal and external funds are limited, and that if manpower is increased, the implementing capacity of the agency to achieve efficient handling of the programme will only increase marginally (if at all) unless all other parameters of implementation, namely internal funding, and administrative capacity and flexibility are also enhanced.

«IRCWD NEWS»

We should like to welcome back **Martin Strauss** who had been working for IRCWD many years ago. He rejoined our team on December 1, 1982, as research associate in sanitary engineering. After graduating from the Swiss Federal Institute of Technology, Zurich, in Civil Engineering, he went to study at the University of Chapel Hill, North Carolina, where he obtained his M.Sc. in Environmental Sciences and Engineering. He then returned to Switzerland to work as sanitary engineer for 2 1/2 years in a private consulting office. From 1976–1979 he was faculty member in the Department of Civil Engineering at the University of Dar-es-Salaam, Tanzania, in the field of Water Supply and Sanitation. In 1979 he joined SATA (Swiss Association for Technical Assistance) and was appointed Regional Programme Manager in the Community Water Supply and Sanitation Programme for the Government of Nepal.

«New IRCWD Project»

Health and socio-cultural implications of night soil use in agriculture and aquaculture

In many areas of the world, particularly in Asia, both untreated and treated night soil is used in agriculture or in fish ponds. In these countries, night soil recycling is a long-standing tradition and the product is appreciated for its high economic value. Besides the intended use of excreta as a fertilizer, a large percentage of night soil from latrines and privies in urban areas of developing countries is dumped haphazardly in the cities' outskirts as a result of a lack of proper sites and inadequate planning and management. Similarly, contents of septic tanks are usually disposed of in a uncontrolled manner.

In most instances, the handling, collection and use of excreta for crop fertilization and fish cultures constitute a health hazard due to the fact that the excreta contains pathogens of a large number of infections endemic in most developing countries. Pathogens are transmitted through harvesting and crop handling activities and through crops and fish eaten raw or improperly cooked. Whereas substantial knowledge exists on potential health risks on the basis of pathogen survival patterns, little is known about the epidemiology of disease transmission through excreta recycling.

Therefore, this project aims at presenting in a condensed form, existing knowledge on pathogen survival and health risks associated with excreta recycling, collecting and reviewing existing epidemiological information, and undertaking epidemiological field studies which should reduce the gaps in epidemiological knowledge.

Disease transmission is not only a matter of pathogens, pathogen characteristics and host susceptibility, but also dependent on a person's and a society's behaviour, social norms, and religious or cultural habits. These elements in turn determine sanitary customs and risk behaviour. Part of the project is therefore devoted to the analysis of the relationship between culture and excreta disposal in areas and societies (such as China or Indonesia) practicing excreta recycling traditionally, as well as in societies which normally do not use excreta as a fertilizer (e.g. Hindu or Muslim societies). It is hoped to finally come up with suggestions regarding the integration of behavioural and cultural dimensions into the planning and implementation of sanitation programmes.

Suggestions and information pertaining to this project are sought and should be sent to **M. Strauss, IRCWD, Ueberlandstrasse 133, CH-8600 Dubendorf, Switzerland.**

New Publications

Land Application of Sewage Sludge: The Status by **ENSIC Review Committee on Land Treatment, K. Rajagopal, B.N. Lohani** and **R.C. Loehr,** 127 pages. This report was published by the Environmental Sanitation Information Center, Asian Institute of Technology, P.O. Box 2754, Bangkok, Thailand, in the Environmental Sanitation Reviews, No. 2/3, May 1981.

The state-of-the-art on land treatment of municipal wastewater was published in the maiden issue of the Environmental Sanitation Reviews, August 1980. In compiling the same, the Committee attempted to present an overview of some of the important research findings in the field.

The present review on land application of municipal sludge is more detailed. It describes the factors to be considered and outlines some of the methodology in the design and maintenance of such systems. It also surveys the existing sludge treatment alternatives and summarizes the present state of knowledge in the field of land application of sewage sludge. This review is confined to the beneficial utilization of sewage sludge for agriculture and for reclamation of disturbed lands, etc.

Researchers, planners, educators, etc. may find it a useful source of information.

Septic Tank and Septic Systems by **ENSIC Review Committee on Septic Systems, C. Polprasert, V.S. Rajput, D. Donaldson** (Reviewer) and **T. Viraraghavan** (Reviewer), 110 pages. This paper was published by the Environmental Sanitation Information Center, Asian Institute of Technology, P.O. Box 2754, Bangkok, Thailand, in the Environmental Sanitation Reviews, No. 7/8, April 1982.

It is a state-of-the-art review on the septic tank and septic systems. Information on design and functional aspects, and environmental effects of septic tank systems are presented. In addition, some important research needs as reported in the literature are pinpointed. This review paper contains neither standards nor rules and regulations pertaining to septic tank and septic systems. The design information presented is intended as technical guidance.

It will certainly serve as a basic source of information to those, besides academicians, who are actively involved in this field.

Sanitation Handbook by **Martin Strauss,** second edition, June 1982, 56 pages. This handbook was produced for the Western Region's Community Water Supply and Sanitation Programme (CWSS) in Nepal.

This second edition focuses on the transmission of communicable diseases common in Nepal, with major emphasis being laid on excreta-related infections and with the potential benefits derivable from improved water use and excreta disposal practices. Diseases and disease transmission paths are presented to show which particular short-comings with respect to water supply, use of water for personal hygiene and excreta disposal are the major common causes of disease communication.

The book also tries to explain that many excreta-related diseases, rather than being water-borne only, are in fact also transmitted due to lack of personal cleanliness.

The design, construction, use and maintenance of latrines, i.e. ventilated pit latrines, for families, schools and health posts are also dealt with in detail.

This handbook is intended to familiarize engineers, overseers and technicians with the basic concepts of sanitation.

Requests for copies should be addressed to: RWSS Pokhara, c/o SATA, P.O. Box 113, Kathmandu, Nepal.

Low-Cost Technology Options for Sanitation – A State-of-the-Art Review and Annotated Bibliography by **Witold Rybczynski, Chongrak Polprasert,** and **Michael McGarry,** February 1982, 184 pages. This bibliography was published by the International Development Research Centre (IDRC), Health Sciences Division and the World Bank's Transportation and Water Department under the Series headed "Appropriate Technology for Water Supply and Sanitation".

The first edition of this bibliography was also published by IDRC and the World Bank and appeared in 1978 under the ISBN No.: 0-88936-155-X.

This comprehensive technology review and bibliography describes alternative approaches to collection, treatment, reuse, and disposal of human wastes. It was based upon an extensive search of the published and unpublished literature. Over 20 000 references were considered and approximately 1200 documents reviewed. As a result, 531 documents were selected for abstracting and used to produce this bibliography. Emphasis has been placed on technological issues, but institutional, behavioural, and health-related aspects of excreta disposal were also considered.

It is designed to describe to the policymaker, the administrator, and the engineer the broad range of approaches to human waste management available today.

Free copies may be obtained from the Energy, Water and Telecommunications Department of the World Bank, 1818 H Street N.W., Washington, D.C. 20433, USA.

Environmental Management of Urban Solid Wastes in Developing Countries – A Project Guide by **Sandra Johnson Cointreau,** Technical Paper No. 5, June 1982, 214 pages. This guide was developed by the Urban, Development Department of the World Bank, Washington, D.C., USA.

This project guide provides information and procedures for planning and implementation of solid waste management improvements. Current Bank objectives, policies, and project requirements are summarized. It also reflects the lessons and experience gained from World Bank solid waste projects. The text discusses establishment of an acceptable standard of collection and disposal service delivery, selection of appropriate technology, development of suitably phased action plans, arrangement of institutions for planning and management, arrangement of financial resources, development of regulatory and enforcement support services, provision of public education and participation programmes, and incorporation of incentives and disincentives to facilitate project success.

Information on solid waste generation rates and compositions for countries of various levels of economic development is provided. Case study information on the formal and informal sector refuse collection and disposal activities prevalent in cities of developing countries is provided. Problems and issues to investigate when planning are highlighted through case study examples.

Annexes to the project guide include sample terms of reference for consultants, a data collection workbook for planning technical and management improvements, and worksheets for calculating municipal budget requirements to maintain, upgrade and expand solid waste management service.

This guide is designed to facilitate project preparation, appraisal and implementation of Bank financed solid waste projects in urban areas. It should also be of use to a wide audience involved in solid waste collection and disposal in developing countries.

Copies are available from the Director, Publications Department, World Bank, 1818 H Street N.W., Washington, D.C. 20433, USA. ISBN 0-8213-0063-6.

POETRI – Programme on Exchange and Transfer of Information, Reference Manual, Volume I, April 1981, Technical Paper Series No. 16.
This manual was published under the joint sponsorship of UNESCO and The Netherlands Directorate General for International Cooperation.

It is the published version of the Manual as used since April 1981 within the POETRI-programme and covers the main steps involved in the planning, design, set-up and management of information support services for water supply and sanitation development in developing countries. It contains six different parts in a loose-leaf format which can be used separately as individual guides and which can also be regularly revised and updated.

These parts are:
- Planning for information support activities at national level.
- Design and setting-up of information services.
- National inventory of information sources on community water supply and sanitation.
- Compilation of user inventories and survey of user requirements.
- Education and training for information support.

This manual mainly aims at managers, information officers and documentalists of information centres and other organisations working in community water supply and sanitation in developing countries.

Volume II of the manual concentrating on tools and training materials is being prepared.

A French edition of the manual is being finalized for printing and will be made available in the near future.

Copies of the POETRI Reference Manual can be obtained from the International Reference Centre for Community Water Supply and Sanitation (IRC), P.O. Box 5500, 2280 HM Rijswijk, The Netherlands. Price: US $ 14.00 to be paid by international cheque or money order.
Non-commercial organisations and individuals **based in** or **from** developing countries may apply for a complimentary copy. Bulk order prices are reviewed on a case-by-case basis.

Maximizing Benefits to Health — An appraisal methodology for water supply and sanitation projects, 1983, 45 pages. WHO Offset Document ETS/83.7, WHO Geneva, Switzerland.

This document considers all of the aspects that must be taken into account if maximum benefits are to result from investments in water supply and sanitation technology. A methodology is proposed which permits the conversion of community and project information into a numerical form, thus simplifying the project appraisal process prior to the allocation of resources to project implementation.

The proposed methodology is a unique one. Fourteen aspects are identified and described in the four broad areas of local health conditions, the nature of physical facilities for water and sanitation, human behaviour and available support services. Each of the fourteen aspects is further subdivided in such a way that a simple scoring system can be applied. The result is that a score of from 0 to 4 can be determined for each of the fourteen aspects. The sum of the aspects scores yields a project score which, when high, indicates a good chance for a successful project. Conversely, a low project score or a zero in one or more of the aspect scores is indicative of potential project failure.

Planners, decision makers, programme implementers and evaluators should find this document to be a useful and practical tool which will help ensure that health benefits will be one of the major dividends from investments in water supply and sanitation.

Copies of the document may be requested from The Manager, Environmental Health Technology and Support Unit, World Health Organization, 1211 Geneva 27, Switzerland.

Environmental Health Engineering in the Tropics: An Introductory Text by **Sandy Cairncross** and **Richard G. Feachem,** 1983, 283 pages. This book was published by John Wiley & Sons Ltd., Chichester, Great Britain, ISBN 0-471-90012-5 (Paper edition).

Many major infectious diseases in tropical and developing countries are amenable to control by environmental interventions. This book describes these infections and the interventions that may be effectively used against them. The book is in sixteen chapters divided in four parts: health and pollution; water supply; excreta and refuse: treatment disposal and re-use; and environmental modifications and vector-borne diseases. The infections described include the diarrhoeal diseases, the common gut worms, guinea worm, schistosomiasis, malaria, bancroftian filariasis and other mosquito-borne infections. The environmental interventions that receive most attention are domestic water supplies and improved excreta disposal, and the relationships between these interventions and infectious diseases are documented in detail.

This book is intended both for those from an engineering background and those from a medical or public health background.

Water Supply and Sanitation in Rural Development: Proceedings of a Conference for Private and Voluntary Organizations held at the Pan American Health Organization, Washington, D.C., USA, December 1—4, 1981, WASH Technical Report No. 14, 1981, 191 pages.

This conference was sponsored by The National Council for International Health (NCIH) and The Water and Sanitation for Health Project (WASH).

The workshop, which these proceedings record, was planned to strengthen the role and contribution of U.S. Private Voluntary Organizations (PVOs) in their water and sanitation projects in developing countries.

Discussions among the National Council for International Health, several private voluntary organizations, and the Water and Sanitation for Health Project (WASH) developed the direction of the programme, which was designed to examine and discuss:

- planning, implementation and evaluation of water and sanitation components of rural development projects, and
- ways to facilitate the cooperation between U.S. PVOs and other organizations in the International Drinking Water Supply and Sanitation Decade.

In order to offer these Proceedings in their most usable form, all presentations have been organized with subtitles so that material can be scanned quickly for the information being sought.

A Functional Index was developed to help find information in terms of concerns PVOs expressed at the conference.

Copies are available from the WASH Project Distribution Center, Office of Health (S&T), Agency for International Development, Washington, D.C. 20523, USA.

Safe Water and Waste Disposal for Rural Health: A Program Guide prepared by the National Demonstration Water Project for the U.S. Agency for International Development, Washington, D.C. 20523, USA. 1982, 232 pages.

This guide is written for people in the developing nations who have the responsibility for developing and implementing water supply and sanitation programs for rural areas. Its purpose is to provide that audience with an overview of the information it will need to promote, design and carry out such a program.

This book is organized in three parts:

Part One: Water Supply and World Health; Part Two: Water Supply and Waste Disposal Systems; and Part Three: Effective Water Supply and Sanitation Programs. Part One provides an overview of the relationship between water supply, sanitation and health and basically defines the problems that safe water and waste disposal systems can help to solve. Part Two presents solutions to those problems from a technical viewpoint, explaining

the major technologies in water supply and waste disposal that are appropriate for use in the rural areas of the developing nations. Part Three describes how to go about establishing and implementing a program that matches technical solutions to water and sanitation problems in an efficient and effective manner.

This book is part of the "Water for the World" series, all of which are focused on providing concrete assistance to the developing nations in planning and implementing projects in rural water supply and sanitation.

For further information, contact the Development Information Center, Agency for International Development, Washington, D.C. 20523, USA.

Water and Human Health by **F. Eugene McJunkin,** July 1982, 134 pages.

This volume is intended to provide an overview of the relationship between water and human health. The primary focus is on water and health in the developing world as influenced by provision of safe, adequate, accessible, and reliable drinking water supplies. Attention is also given to diseases associated with occupational and recreational contact with water and with animate vectors of disease which live or breed in water habitats. Emphasis throughout is on microbiological agents of disease. These are the water-related diseases of highest priority in the developing world.

Section 1 of this volume provides a background and general overview. Sections 2, 3, 4 and 5 cover water and health aspects of specific diseases. Sections 6, 7 and 8 address health considerations in production of drinking water. Section 9 reviews published epidemiological and other models of the health impact of water supplies, primarily in developing countries. Section 9 may be of special interest to those involved in implementation of programs related to the International Decade for Water Supply and Sanitation.

Further information regarding this book may be obtained from the Development Information Center, Agency for International Development, Washington, D.C. 20523, USA.

S. Peter, Editor
"IRCWD News"
Swiss Federal Institute for Water Resources and Water Pollution Control (EAWAG)
Ueberlandstrasse 133, CH-8600 Dubendorf, Switzerland