

A UNICEF PUBLICATION ON WATER, ENVIRONMENT, SANITATION AND HYGIENE

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A future global agenda for children: The links with sanitation, hygiene, water and environment

Searching for effective ways to make new breakthroughs for the world's children, UNICEF recently made preliminary recommendations for a global agenda for children (*The future global agenda for children: imperatives for the twenty-first century*, paper presented to the UNICEF Executive Board, document E/ICEF/1999/10, 13 April 1999). The agenda stresses three goals centred on crucial developmental stages in a child's life, because within them lies the key to breaking persisting cycles of poverty:

- Infants start life healthy, and young children are nurtured in a safe and caring environment that enables them to be physically healthy, mentally alert, emotionally secure, socially competent and intellectually able to learn.
- All children, including the poorest and most disadvantaged, have access to good-quality basic education and complete the basic education cycle.
- Adolescents have the opportunity to fully develop their individual capacities in safe and enabling environments, and are helped to participate and contribute to their societies.

While shielding children from preventable death must always remain a UNICEF priority, the new strategy goes beyond child survival: it places early childhood care and education for all at the heart of a wider undertaking to realize

children's rights and eventually reduce poverty, recognizing always that there are inherent links between the survival, development and well-being of children and the realization of women's rights from girlhood onwards.

A new context for sanitation, hygiene, water and environment activities

Early childhood care

The vital importance of children's earliest years is reflected in one of UNICEF's latest

approaches, the ECC programme (Early Childhood Care for Survival, Growth and Development). Focusing on the child from conception until the age of eight, with special attention to the first four years, the

approach seeks to achieve the full potential of every child by working within the family and the community and by using an integrated rather than a sectoral approach.

In a world where the health and lives of more than half the world's children are constantly threatened by environmental hazards, most of these in their own home and immediate surroundings, it is easy to see how children gain from access to safe and convenient drinking water and from activities to promote appropriate hygiene and sanitation practices, as well as protection against environmental threats.

Water and environmental sanitation pro-

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[The strategy] places early childhood care and education for all at the heart of a wider undertaking to realize children's rights and eventually reduce poverty...

grammes that have already shifted away from the conventional delivery of water and sanitation services, towards the promotion of hygiene and sanitation within family and community, readily find their place within the ECC approach. For these programmes the challenge is to remain focused on children and to create synergy with all the other programme sectors involved in the complex process of child development. As Colin Davis phrased it in his speech at Addis Ababa, reproduced in this issue of *WATERfront*, “as we are about to enter the next millennium, it has perhaps never been more urgent to ensure that integration, or at least convergence, actually takes place”—meaning integration not only of water, sanitation and hygiene activities but of all activities that foster full development of the young child.

For water and sanitation programmes that have yet to make the shift, the ECC approach supplies a framework for it. UNICEF New York recently prepared and tested a draft manual for three-day workshops on the approach (see box), to help communities and households analyse their needs in a way that will lead to the convergent programming envisaged in the global agenda for children. The workshop manual includes coverage of hygiene and sanitation issues.

Basic education

Meeting every child’s right to basic education will produce many positive outcomes for children and help break longstanding cycles of deprivation, discrimination, and exclusion. It goes without saying that children need to be able to learn in healthy, clean and safe conditions. School sanitation and hygiene education are integral to schoolchildren’s education and health, improving both the school and the children’s achievement at school, and must not be perceived as peripheral improvements that are merely tacked on to a school and its curriculum.

Indeed, school sanitation and hygiene education activities, together with health and nutrition interventions, be-

come even more important under the global agenda for children: as countries near their goal of education for all, the new intakes of children swelling the school populations will likely be the more deprived children, living in more difficult circumstances. These children may have had much less exposure than other children to basic sanitary facilities like latrines and to good hygiene and health practices.

UNICEF is already active in many countries in school sanitation and hygiene education, and the goal of clean, safe schools is receiving fresh impetus under two major new programmes:


- The Netherlands Government has pledged supplementary funding of \$1.2 million for methodology development and knowledge dissemination: pilot programmes in six countries went into action in November 1999, under the general guidance of UNICEF New York and the IRC International Water and Sanitation Centre in Delft. The six countries are Burkina Faso, Colombia, Nepal, Nicaragua, Viet Nam and Zambia.
- Under the Global Environmental Sanitation Initiative, UNICEF and its partners are trying to mobilize the funding to test and advocate integrated approaches towards a safe school environment for all children, with linkages to community actions and health education. The plans include regional and international

meetings, developing advocacy materials, and documenting pilot programmes.

Adolescent development

Recognition has been growing of the threats faced by adolescents, notably unemployment, lack of access to quality education, vulnerability to infections such as AIDS/HIV, and involuntary involvement in armed conflicts or violence.

Here again, a role for water and environmental sanitation is not difficult to find. A safe and supportive home, school and community environment is as necessary to teenagers as to younger children, and adolescents are at special risk in the street and the workplace. At the same time, teenagers are a valuable resource for sustainable human development, and participation in community development can be meaningful to both the young people themselves and the community as a whole. Water and sanitation activities that can benefit from involving young people and simultaneously build their skills and self-esteem include maintenance of water points, teaching hygiene to younger children, care of the local environment, and other roles in upgrading their communities.

The global agenda for children offers rewarding challenges for all of us who work in the fields of sanitation, hygiene, water and environment. More children are surviving today than ever before, into conditions that have improved too slowly if they have improved at all. This is the time to take up the challenge. 

Draft manual for workshops on early child care

UNICEF has recently developed a draft manual for three-day workshops on the ECC programme approach. The workshops are organized around the triple A principle—analysis, assessment, action—starting from what people already know, do and want to help communities gauge their priorities and choose suitable action.

The chapter on hygiene and sanitation in the workshop manual lists the environmental hazards for child health and identifies the most significant, such as transmission of diarrhoeal diseases; environmental issues are also checklisted on the sheets for the household observation visits that are a key element in the process.

The manual is intended for all personnel of programmes involving caretakers of children aged 0–3 years, from whatever sector—water, sanitation, health, nutrition, agriculture, community development, family planning, education, women’s issues and the media. Copies are obtainable from the WES Section, UNICEF New York, wesinfo@unicef.org.

The night Mitch hit Tegucigalpa: 800,000 left without water and sewer services

By Anthony P. Brand, Secretary, Regional Water and Sanitation Network for Central America, Tegucigalpa, Honduras

During the last week of October 1998, the most lethal hurricane on record would plunge Honduras into a national emergency from which it will take many years to recuperate. Hurricane Mitch crawled just offshore of Nicaragua and Honduras, raining heavily for a week before making landfall. But in a matter of hours, it veered inland and crossed the entire country, causing damage in every one of Honduras' 18 departments. In the storm's last hours over Tegucigalpa, the capital, and southern Honduras, more rain fell (almost 900 mm) than normally falls during an entire year. Unfortunately, so many of the country's watersheds have been overexploited that these heavy rainfalls caused inordinate mudslides and damage, especially around the capital.

Nationwide, almost 2 million people were driven from their homes and some 14,000 disappeared or died. When most families returned home after the storm, it was to find much of their crops and dozens of roads and bridges destroyed or unusable. Some 200,000 people, 80% of them women and children, lost their homes. Of the 15,000 citizens of Tegucigalpa left homeless, most were among the very poor living along the polluted riverbanks or on the steep hillsides in the *barrios*. During a survey of the damage, a helicopter crash took the lives of Cesar Castellanos, the popular city mayor, and three others.

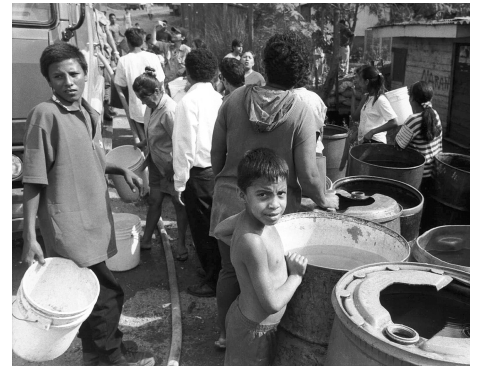
All over the country, water and basic sanitation infrastructure was crippled. Wellfields were flooded, pumps ruined and sewage systems burst. Forty-eight of the country's 50 largest cities and towns reported damage to systems and failures in their water supplies. Nationwide, 70% of the population, nearly 4.2 million people, lost water service. The Ministry of Health estimates that 3,500 rural wells

were knocked out and that almost 52,000 latrines, serving more than 300,000 people, were destroyed or left unusable. Of the 4,066 rural piped water systems, almost half (1,800) were out of service by the morning of 31 October, mostly as the result of landslides damaging or destroying main conduction lines and intakes. Hand-dug wells were filled in and handpumps swept away. Many of the wells that remained were severely contaminated.

By midnight, Mitch hit Tegucigalpa, the Honduran capital of close to a million people. Confounding the scientists that had just downrated it to a tropical storm, it saved its most intense rains and greatest damage for last. Power was knocked out nationwide and weary radio announcers broadcast by emergency generators all night, warning which neighbourhoods were flooding and where makeshift shelters were being established. At 2 a.m. the call went out to save the trucks and cars of the National Autonomous Water and Sewer Service (SANAA), the nation's water supply agency: as the flood reached SANAA's downtown headquarters, the rising water was twisting the vehicles like toys around poles and buildings or sweeping them away altogether.

All of the city's four aqueducts into the capital were out of service. Only a few scattered deep wells were pumping for tank trucks. Three of the city's four water purification plants were out of commission (one washed completely away) and the floods had buried or swept away thousands of lengths of pipe, hardware, tools, pumps and pick-ups. The entire supply of chlorine gas was gone, under thousands of cubic feet of mud.

The threat to public health was increasing each day. Although rich and poor neighbourhoods alike had been flooded and none had piped water, the



UNICEF/HQ98-0610/Alejandro Balaguer

Displaced families wait to fill containers with water from a tank provided by UNICEF in the community of Miraflores, unaffected by hurricane Mitch and housing some 350 displaced people south of Tegucigalpa.

homeless, sick and poor were the hardest hit. More than 21,000 people in Tegucigalpa had flocked to 130 makeshift shelters in schools, churches and community centres, none of which had running water and few had adequate sanitary facilities. Public and private hospitals faced crisis, with no water for patients or hygiene. Hundreds scavenged for spoiled food in the public markets, now filled with two or three stores of mud.

Fortunately, SANAA and UNICEF have for a decade supported a peri-urban programme that supplies water to low-income neighbourhoods. The Executing Unit for Barrios in Development had 10 water tank trucks for regular service to the highest *barrios*, and these were quickly pressed into 24-hour service. Hospitals and shelters were their first priority, but before the first day of the emergency was over SANAA realized that these trucks alone were not going to be enough.

For the hundreds of thousands of people that were waiting for SANAA water trucks to come to their neighbourhood, it was frustrating to see private

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water vendors servicing those families with enough money (\$50) to buy a truckload of water. Long lines were forming wherever there was a rumour that a SANAA truck might arrive. When the trucks finally did, they were so overwhelmed that they quickly ran dry, and in some places long lines of anxious people left with empty buckets were beginning to turn angry. A social crisis, as well as a public health disaster, might come next.

SANAA called all private water vendors to their civic duty, offering to hire them to deliver public water. Private trucks, however, were making more sales than they could handle at their own prices. In the second Emergency Decree issued by President Carlos Flores, the SANAA quickly developed a system to dispatch its new fleet of 60 water trucks, in twos and threes to adequately cover a given *barrio*. Regular schedules were developed to deliver water to shelters and high-risk neighbourhoods every two to four days. Hospitals were targeted for daily or more frequent deliveries.

Gradually, the hard-working (and little-sleeping) SANAA staff began to bring piped water into Tegucigalpa. After four days, water was flowing from one main reservoir, but the distribution network was so heavily damaged the water could not be delivered. Emergency pipe was laid above ground to get water to critical areas. Crews worked feverishly in the mountains to replace destroyed main lines and in the city to repair or bypass the damaged distribution network. But the situation was not stable, and serious epidemics seemed likely if additional help was not rallied.

But as soon the storm lifted, a sea change in the attitude and organization of Hondurans began to appear, and grows stronger still today. Neighbour helped neighbour and soon entire neighbourhoods were spontaneously organizing crews to search for victims and begin the clean-up. Honduran churches, NGOs, and businesses joined forces with the police and government agencies. Foreign agencies, churches, governments and armies quickly mobilized relief supplies and crews.

The major actors in the national water and sanitation sector (including UNICEF) have for the last decade been coordinating strategies and actions through a unique Collaborative Group for Water and Sanitation. Ideally suited to post-disaster efforts, this formal body, under the leadership of the Ministry of Health, quickly divided the country among its member agencies. In each zone, a different NGO, donor or government programme organized damage assessment and supplied guidance for international donations, providing a fast and coordinated response that covered the country.

Within the UN system, UNICEF Honduras was designated the focal point for water and sanitation to coordinate donations and facilitate the activities of SANAA and the Ministry of Health. The first actions taken were the donation of emergency water tanks for shelters and the organizing of water trucks. For the reconstruction of communities throughout the country, UNICEF supported damage assessments; provided technical assistance for water supply and sanitation to shelters; arranged donations of emergency water treatment plants, pipes and tools; and provided 350 tons of lime, chlorine and other chemicals. As SANAA's manager Humberto Puerto noted, "UNICEF was one of the very first international agencies to mobilize support for the country. We are very grateful." In parallel with emergency support to the central Government, UNICEF's relationships with dozens of municipalities supplied a ready channel to reach rural Hondurans with spare parts and chlorine.

Internationally, UNICEF mobilized journalists and high-profile visits by UNICEF National Committees and the Executive Director, Carol Bellamy. Funds and volunteers have come from all over the globe.

International volunteers found themselves working side by side with Hondurans of all classes. Market vendors, students and professionals were cleaning mud from downtown buildings and homes, delivering food or staffing nearby shelters. UNICEF and the Na-

tional University recruited 10,000 volunteers, close to 4,000 of whom were working to get water delivered. Students, Boy Scouts and UN Volunteers guided water trucks on their deliveries, cleaned out SANAA warehouses and dug pipes, valves, trucks and supplies out from under acres of mud.

Health promoters and staff from the Ministry of Health, along with volunteers, canvassed the *barrios* with household visits and group meetings to promote and distribute chlorine and to orient neighbourhoods on how to protect their health.

The actions of Honduran public health and water officials, with timely support from international partners, prevented outbreaks of disease in the weeks after the hurricane. While cases of diarrhoea did increase dramatically after Mitch, the only near-outbreaks of cholera and leptospirosis occurred in flooded areas in the north of the country, where stagnant water remained for weeks. Some of the first volunteers and families that attempted to clean up in those areas suffered from these sanitation-related diseases, until a Cuban medical unit and others identified the problem and appropriate measures were taken. Boots and gloves were issued to all those that needed them, both in the north and among Tegucigalpa's volunteer brigades.

In the capital, SANAA made progress in restoring the water supply. Two weeks after the disaster, about 25% of the city had rationed water service. After one month, less than half were back on line. Three months later, 80% of the city had service restored. Now, eight months after the storm, all but 10% have water service.

The sanitation situation is much more drastic. The city sewer system was already very deficient before Mitch, but is now beyond repair. The storm overwhelmed the network; pipes were irreparably broken and collectors cracked open, spewing sewage onto the streets. Almost \$150 million is required to restore what was lost and expand sewerage to all residents. The threats to their health from contamination are still very real,

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“Everybody lives downstream”

—World Water Day 1999

The UN system celebrates World Water Day every year on 22 March. The theme for 1999 was “Everybody lives downstream.” All people, whether they live in cities or the countryside, are affected by the activities of their neighbours that impact on fresh water. While sound conservation and management policies have a positive

impact on neighbours, it is unfortunately more common to find upstream neighbours polluting the water for consumers downstream.

UNICEF field offices marked the event by participating in activities organized with their counterparts. Here are some examples.

Bhutan

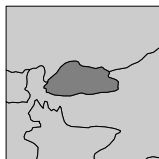
By Sampath Kumar,
UNICEF Thimphu

World Water Day was celebrated in 15 of Bhutan's 20 districts. The highlight of each event was the inaugurating of a new rural water supply project for that district. Every event was attended by the district *dzongda* (administrator) as well as key community representatives from each block of the district, community members, and block and district administrative personnel.

Minister Sangay Nidup of the Ministry of Health and Education and the UNICEF Representative attended the celebration in Chukha district. In Thimphu district, staff from various ministries and from UNICEF took part. The activities in Samdup Jongkhar district featured students from the Royal Bhutan Polytechnic.

The main topics:

1. *The theme “Everybody lives downstream”.* The importance of constructing latrines and proper drainage was discussed, as was the protection of drinking water sources from animals and from various human activities, planting trees to prevent soil erosion and drying up of water sources, keeping stream water clean, and related issues.
2. *Good management of water resources.* The topics covered included the use of water for drinking, other domestic purposes, animals, and irrigation; personal, household and community



hygiene; and proper storage and handling of drinking water.

3. *Prevention and control of water-borne diseases.* Audiences were briefed on how these are spread and how to prevent them, for instance by proper food preparation and storage. Washing of hands was emphasized.
4. *Operation and maintenance of water supply schemes.* Under this heading, speakers reviewed the importance of good O&M and the key role of communities.

The Bhutan Broadcasting Corporation aired several programmes and interviews on water and hygiene. *Kuensel*, Bhutan's only newspaper, published a two-page supplement on these themes.

Since the Water Day celebrations proved a useful way to disseminate key messages, the Government now plans to celebrate it every year in the nation's districts and blocks.

Afghanistan

By E. Karim,
UNICEF Kabul

The seventh World Water Day was celebrated near Kabul in the central region and in the eastern provinces of Nangarhar, Kunar and Laghman.

UNICEF joined forces with the Rural Rehabilitation Department (RRD) to honour the Water Day in Bakhtyaran village, Dehsabz district, about 24 kilometres south-east of the capital, Kabul. The open-air event lasted from 10 a.m.



to 12 noon and was attended by around 300 people. Among them were the UNICEF Representative; the head of RRD; Taliban authorities; representatives of UN agencies and NGOs; and community members, including children.

The speakers at the event (the UNICEF Representative, head of RRD, Taliban personnel, and the head of the International Committee of the Red Cross water programme in Kabul) emphasized the importance of safe drinking water and keeping water sources clean. With technical and financial support from UNICEF, RRD has recently provided Bakhtyaran's villagers with safe drinking water through the construction of handpump wells under an integrated water, sanitation and hygiene project for about 25,000 people in Dehsabz district.

The Water Day was also feted in Jalalabad, at the heart of the eastern region. The activities, held at the Sanitation Training and Demonstration Centre, centred on the theme of clean river basin management and also focused on the role of women and girls in handling the difficult job of transporting water for domestic uses.

Other provinces of the eastern region hosted events organized by RRD personnel. Female education monitors held meetings and discussions with women in Mehterlam (capital of Laghman province), Surkhrod (district of Nangarhar province) and Asadabad (district of Kunar province). RRD Kunar held a gathering on the bank of the Kunar river in Narang district which brought together government officials,

community leaders, community members and RRD staff.

At all these events to salute World Water Day, colourful banners carried messages on the importance of safe water, keeping water sources clean and paying attention to hygiene and the environment.

Cape Verde

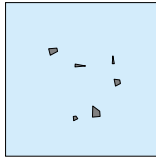
By Antero de Pina,
UNICEF Praia

Cape Verde is a very small country of 400,000 inhabitants with an estimated drinking water supply coverage of 76% (86% in urban and 58% in rural areas). Most people still depend on public water points for their needs, as house connections serve less than 20% of the population. Sanitation coverage is still quite low, estimated at 39% in 1998 (61% in urban and 19% in rural areas). In consequence, diarrhoeal diseases remain one of the leading causes of childhood morbidity and mortality.

Because of rainfall scarcity and irregular distribution (less than 250 mm a year, but sometimes in heavy downpours), the country is becoming each year more dependent on desalination plants, which are already the main sources of drinking water in the three major urban centres—Praia, Mindelo and Espargos. Some islands (mountainous) still rely on groundwater and springs for irrigation and domestic consumption. Despite annual floods, rain-water harvesting using catchment dams has failed to attract because of the high investment costs.

The preparations for World Water Day 1999 were mounted by personnel from the UNICEF water supply and sanitation programme, the UNDP-funded Cape Verde water and sanitation project, and a national NGO for protecting the environment. Activities centred on schools, to promote safe environmental and hygiene practices and raise awareness of the need for water conservation.

Some 200 schoolchildren gathered at a Praia secondary school to hear a speech on water conservation and pollu-



tion and watch a video on the consequences of water pollution, followed by a debate and a question-and-answer session. On the islands of Santiago and Maio, a further 800 schoolchildren attended safe hygiene promotion sessions at five primary schools. Parents and teachers performed in lively plays dramatizing the issues, and the children won prizes such as toothbrushes, combs, nail clippers and copies of *Facts for Life*. National television, radio and a newspaper covered these events.

For next year an official partnership is being drawn up between the National Water Resources Management Institute, a national NGO and the UNDP water and sanitation project to establish annual prizes for primary and secondary school students. This national contest will be used as an advocacy tool to promote World Water Day 2000. The plans include hands-on experience for the schoolchildren and field trips to project sites, with the emphasis on water conservation and production using renewable energy.

Côte d'Ivoire

By Souleymane Diabate,
UNICEF Abidjan

World Water Day was celebrated in Côte d'Ivoire by the Government with the support of UNDP, UNICEF and a private-sector enterprise (SODECI) involved in distributing water nationwide.

On 21 March, the eve of Water Day, the Minister of Infrastructures delivered a speech on national television, widely covered by the press, on the theme "Everybody lives downstream".

On 22 March the High Commissioner for Hydraulics held a conference presenting the nation's new law on management of water resources. In the debate that followed, the audience showed keen interest in this new instrument for managing the water sector: the Minister explained its benefits and stressed the need to promote it with the help of NGOs and the media. This event, too, was covered by national television.

And finally, a photo exhibit was opened to the public that afternoon,



organized by the World Bank's local water and sanitation group around this year's Water Day theme.

Malawi

By Kabuka Banda,
UNICEF Lilongwe

National radio broadcast a panel discussion on the eve of World Water Day. The panel consisted of colleagues from the Ministry of Water Development; the UNDP/World Bank water and sanitation group; the Environmental Affairs Department; the national water boards; and UNICEF. Issues discussed included environmental protection; water resources policies; community involvement in resource protection, development and management; and the roles of various stakeholders in the management of water resources.

The Lilongwe Water Board, one of five in the nation, mounted an open day. The Minister of Water Development made the speech declaring the exhibits open, and the Controller of Water Services (Ministry of Water and Irrigation) also toured the display.

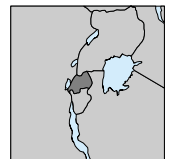
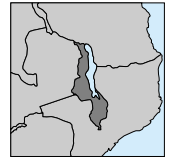
The event went well and attendance was good. About 70% of the visitors were schoolchildren from primary and secondary schools around the city.

A popular attraction was the video show that ran all day. 'Malangizo a Ukhondo', adapted from the video 'Prescription for Health', shows water pollution, unprotected water sources and the unhygienic practices common in many households; it spells out the risks to children's lives and presents various solutions.

Rwanda

By Flavia Mutamutega,
UNICEF Kigali

In Rwanda, World Water Day was heralded by a full week of sensitization activities organized by the Ministry of Energy, Water and Natural Resources and Environmental Protection (MINERENA) in collaboration with many of its partners for water and sanitation—UNICEF,



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Introducing SanPlat latrines in Niger

By Arlette Yepdujo, Hygiene/Sanitation Consultant, and Christian Guerre, WES Officer, UNICEF Niamey

Sanitation problems in Niger

The health situation of Niger's population is critical, particularly for children, who suffer high rates of illness and death from repeated bouts of diarrhoea. According to the 1998 *Demographic and health survey* for Niger, 38% of children under five had had one or more episodes of diarrhoea in the two weeks preceding the study. The prevalence of diarrhoea is particularly high in young children aged 6–11 months (50% had diarrhoea) and 12–23 months (41%). The main cause is poor hygiene habits among the population. The situation is all the more serious because 95% of households in rural areas have no toilet whatsoever (DHS survey, 1998)—and 80% of the population live in rural areas.

Sanitation plays an important role in protecting populations from illness. It also has an important influence on children's nutrition, as it helps them to avoid intestinal worms. Depending on the size of the worm load, roundworm (ascariasis) can divert a large part of children's food intake. Whipworm can retard children's growth, and hookworm is a leading cause of anaemia. The absence of latrines in 95% of villages is without a doubt one of the causes of children's malnutrition in Niger.

In discussions, women are often asked why they would like to have a private toilet, and regularly give the following response: "When we give birth, we don't have enough strength to go far to seek the privacy to relieve ourselves. A latrine would be a welcome relief for us." Approximately 60% of births in rural areas take place away from the health centres where a latrine would be available.

In Niger, there are sequestered women who can defecate only after dark. Quite apart from the distress caused by waiting for nightfall to defecate or urinate, this can lead to serious illness.

For the above reasons, the introduc-

tion and widespread distribution of a latrine accessible to the poorest presented itself as a challenge to be overcome. It was therefore considered necessary and even urgent to promote the use of a low-cost latrine that could be distributed throughout Niger. The project chose SanPlat (sanitary platform) pit latrines.

Promoting SanPlat latrines

A key strategy of the sanitation project in Niger is the promotion of new low-cost technologies that the population can easily acquire and learn to maintain.

During the testing of family latrines, several modifications were introduced to the original SanPlat slab, to adapt the technology to Niger's extremely hot climate and make it more acceptable to local users.

The project to construct SanPlat latrines developed as follows: a regional workshop on SanPlat technology, organized by the UNICEF Regional Office for West and Central Africa, took place in Nigeria in 1996, attended by both the water and sanitation programme administrator from UNICEF Niger and the principal technical adviser for the village water supply project in Dosso province (funded by the Netherlands Government). After the workshop, the following actions were taken in the field:

1. Village training units provided training and education to their communities to increase their awareness of hygiene.
2. The Government trained technical officers to build SanPlat latrines—specifically, how to manufacture SanPlat slabs and how to reinforce

the walls of latrine pits after excavation, because the soil is usually sandy and tends to crumble.

3. Government officers trained local masons in SanPlat latrine construction techniques.
4. The skills of NGOs and private-sector labourers were supported and strengthened.
5. Various personnel from Niger (the staff of local NGOs such as VNVP, government technical officers, UNICEF personnel) attended the 1997 regional workshop on SanPlats in Ouagadougou, Burkina Faso, which made it possible to share experience and improve participants' expertise.

A pilot project went into action at the end of 1996 in the Saguia district of Niamey city. The aim was to test SanPlat slabs of all shapes and sizes, so that users could express their preferences, and then adapt the slabs to suit the cultural and climatic conditions in Niger.

Modifying the SanPlat slabs for Niger

During the testing of family latrines, several modifications were introduced to the original SanPlat slab, to adapt the technology to Niger's extremely hot climate and make it more acceptable to local users.

First change: thickening the slabs

The thickness of the slab in Niger is 6 cm instead of the original 4 cm. This modification was introduced to make the slab more acceptable to users, who found that the original slabs were not supporting their weight.

Second change: reinforcing the concrete

The circular slabs were reinforced by two steel rods, 0.6 cm in diameter, laid

in an outer ring 3.50 m long and an inner ring 1.90 m long. The reinforcement was needed for several reasons:

- In rural areas the materials used to make the slabs are not always standardized: the gravel is not always clean, and is sometimes the wrong grade (12 mm preferred).
- The users have more confidence in reinforced concrete than standard concrete.
- The mixing of the cement, sand and gravel to make the slabs is carried out with varying degrees of precision by the masons.

The cost of these modifications—600 francs CFA per slab, or nearly \$1—is small compared to the advantages: they increase the users’ sense of safety and make the SanPlat latrines more acceptable.

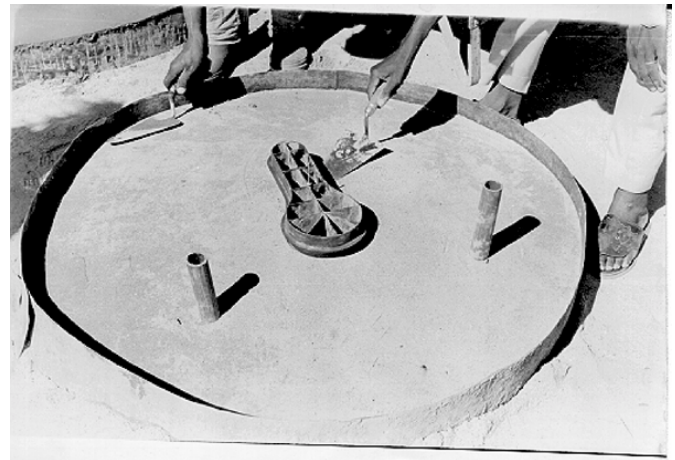
These first two modifications were made after observing people’s reactions when the latrines were introduced, and after assessing the quality of the materials available in the villages.

Third change: ventilating the slabs

A third modification was made two years after the latrine construction project began. This modification, which does not affect the cost of the latrines, is very important for the users, women in particular, and especially so during the hot dry season, which lasts almost 10 months in Niger.

The SanPlat slab is perforated by two ventilation holes, 4 cm in diameter, which release the hot air trapped in the latrine pit. The openings are placed on either side of the slab’s central axis, behind the drop hole, and centred between the two steel reinforcement rings.

This improvement to the slab is important, particularly for women, who were experiencing discomfort when using the latrines. In the hot season hot air is trapped in the latrine pit: when



Slab manufacture, showing ventilation holes.

users took the lid off the drop hole to relieve themselves, they received a blast of heat escaping from the pit. This is unpleasant and off-putting, particularly for women who are menstruating or pregnant.

To try to solve the problem, the families with latrines altered the shape of the drop hole, which had been scientifically tested, and reduced it to a smaller, round hole. This modification failed to

continued on next page

■ **World Water Day** from page 6

other UN agencies, international NGOs, government institutions and donor agencies such as the German Agency for Technical Cooperation (GTZ). The events included field visits to water schemes in the east of the country—a region with serious water supply problems—and an exhibition of photos and other relevant items.

The activities culminated on 22 March with a well-attended seminar at a Kigali hotel on the problems of water in the world in general and in Rwanda in particular. Among the participants were high-ranking government officials (notably the ministers heading MINERENA, the Ministry for Youth and the Ministry of Education); the Director-General of Electrogaz (the parastatal in charge of water and electricity distribution); representatives of UN agencies, local and international NGOs, and local authorities; and journalists.

The debate was lively, and the group

agreed on the following strategies for better management of water resources:

- Support the rational utilization of water through water collection systems, treatment and storage mechanisms.
- Protect the environment to avoid pollution and ensure a clean environment.
- Develop an urbanization master plan so as to plan distribution according to anticipated needs.
- Increase water infrastructures on a sustainable basis involving communities, and develop regional solidarity mechanisms.
- Set up community-based mechanisms for the protection and management of water systems.

Recognizing that ‘everybody lives downstream’, UNICEF’s programme of


cooperation with the Government of Rwanda currently features support to community-based water and sanitation management systems in 32 communes, and support for national policy development.

IRAQ

Zaid Jurji, WES-officer Baghdad

Rehabilitation works in Al-Rashid plant started in Dec 1998 and were completed in March 1999. The inauguration ceremony took place on 22 March 1999 as part of celebrations of the International Water Day and was attended by the Mayor of Baghdad and UNICEF Representative.



For further information on World Water Day, see its website hosted by the IRC International Water and Sanitation Centre at <http://www.irc.nl/products/advocacy/www/>. 

solve the problem, since hot air was still trapped in the pit; indeed, it actually created a hygiene problem.

The problem was evident to the users as soon as the first SanPlat latrines were constructed, but since all problems involving people's privacy are sensitive issues, they did not immediately voice their discomfort. It took time for a climate of confidence to be established among all involved, so that women could explain the problem clearly.

Once the problem was identified, it was necessary to find a solution. The problem was duly solved by introducing the two ventilation holes to allow hot air to escape continuously from the latrine pits so that users could feel at ease when using them.

To make the ventilation holes when the slabs are being manufactured, two PVC pipes 4 cm in diameter and 30 cm long are placed in the sand in the surrounding mould before the concrete is poured. The pipes serve as the mould for making the holes and should be removed before the cement hardens (15 to 20 minutes).

The SanPlat slab has been improved by adapting it to Niger's extremely hot climate, reinforcing its potential for safeguarding the users' health. The families have welcomed the improvements enthusiastically.

The latrine programme

During the pilot phase of the project in December 1996, 20 latrines were constructed in Saguia district. In the following year 797 latrines were built in six

districts, and a total of 1,925 latrines were built in 1998. At the time of writing some 1,200 latrines are under construction. The plans for 1999 projected a total of 3,649 latrines, but by year's end the actual total was due to reach 6,391 latrines, all constructed with the help of UNICEF Niger.

At present the usage rate for the latrines is 100%, but only 50% of the latrines are well maintained. The inadequate maintenance is due to families' lack of awareness and also the dearth of water for cleaning out the latrines.

Costs of SanPlat latrines in Niger

Circular SanPlat slab, 1.20 m in diameter: 5,500 CFA or about \$9

Circular SanPlat slab, 1.50 m in diameter: 6,750 CFA or about \$11

Square SanPlat slab, 60 cm by 60 cm: 2,250 CFA or about \$3.50

So far, 98% of the families have chosen the round 1.20 m slabs, and 2% have chosen the round 1.50 m slabs. The square slabs are being used to upgrade school latrines.

A SanPlat latrine costs 25,000 CFA or about \$40, not including the external structure. In the first phase of the projects, UNICEF contributes 40% of the cost of the latrines, i.e. 10,000 CFA or about \$16: the beneficiaries supply the remaining 60% plus the external structure, which is made in the material of their choice (*banco*—the local adobe—or straw).

The 60% paid by the beneficiaries in the first phase is distributed as follows: 24% in cash (6,000 CFA or \$10) and 36% in labour (9,000 CFA or \$15): the family members contribute both bricks and labour to the construction.

After about 40 sample latrines have been built in a village, UNICEF assistance during the second phase of the project goes down to 25% of the cost of the latrine. In the third and final

phase, families take on the total cost of the latrine.

Factors for success

The success of the project is due to the strengthening of the skills of community members, government officers, and private-sector masons. Training workshops have been organized for a wide range of personnel:

- 120 community masons have been trained in constructing SanPlat latrines.
- 21 government technical officers (technicians and sanitation agents, hydraulic technicians and rural management technicians) have also been trained in construction.
- The staff of three NGOs (VNVP, CDR and SAPHTA) have received construction training.
- Some 300 members of village training units are now at work to raise awareness among the population.
- In the city of Agadez, 160 women on 16 health committees have been trained to raise awareness of hygiene among their communities, with particular emphasis on the use of latrines by all members of the family and on washing hands at critical times.
- In Maradi province, each village in the project has a village training unit of three members, two of them women. These village units have been trained in communication techniques by UNICEF information/communication personnel, to raise awareness of hygiene in their community.
- A member of SAPHTA, a women's NGO, has been trained in constructing SanPlat latrines. She will be responsible for training women masons in her unit.
- A further 66 community masons and six government officers are due to complete training by the end of 1999.

To facilitate the distribution of the SanPlat slabs, five production centres have been set up in Agadez and Arlit,



Completed slab.

and more centres will be established in other towns. In the villages, masons manufacture the slabs on site.

The SanPlat latrines have a promising future in Niger. During a training session for communities in Maradi province, villagers were asked why there was such a contrast between their great desire for a latrine and the painfully slow progress in building latrines fully financed by the families. The women replied that household improvements and building chores are the responsibil-

Sanitation problems touch on issues of individual privacy. There should be good collaboration between technicians and the target populations so that problems can be identified, discussed and solved.

ity of the men: the men, meanwhile, replied that the women are the ones with the financial means, because they own the small livestock to be seen around every village. The upshot: the men authorized the women to take charge of constructing the latrines. The resolving of this debate enabled the women to become aware of their husbands' standpoint and become involved in building the latrines. This transfer of responsibility from men to women could lead to rapid progress in spreading the use of latrines in the area.

The collaboration between personnel of various UNICEF programmes has also been a factor for success: for example, sanitation and education staff have been working together to promote the construction of school latrines.

UNICEF is also collaborating with other development partners who have made basic sanitation a priority, such as the Evangelical Church of the Republic of Niger, the water supply project of Arnagou village in Aguié district, and the Dosso village water supply project. The Dosso project has adopted the

SanPlat technology, and has funded approximately 2,015 SanPlat latrines in project villages.

Lessons learned

The introduction of a new technology sometimes requires modifications in order to adapt it to the realities on the ground and make it acceptable to the users.

The use of SanPlat latrines is relatively recent in Niger. Technical follow-up on how the latrines are being built, used and maintained should continue over quite a long period, in order to make sure that all the problems are solved and good hygiene practices adopted.

Basic techniques must be transferred properly. In the course of supervisory visits, it was noted that during the training of local masons by government officers, some information was omitted that needs to be included.

Sanitation problems touch on issues of individual privacy. There should be good collaboration between technicians and the target populations so that problems can be identified, discussed and solved.

Conclusions


The first point worth noting is the improvement of the slabs following the information supplied by the women users, which led to the introduction of the ventilation holes to release heat and so eliminate users' discomfort.

The second notable point is the high percentage of the population choosing the round slabs over the square one, which costs less. The users were willing to pay extra for an option they preferred. The fact that families have been willing to cover a large part of the costs of the latrines—60% on average, counting contributions both in cash and in labour—also bodes well for the project's sustainability.

Future outlook

The long-term objective is to encourage 100% of the families in project areas, both rural and urban, to acquire a private latrine, use it, and maintain it in

good condition, with UNICEF funding eventually phasing out altogether. For this to happen, the following approaches are recommended:

- Continue to provide a high level of attention and support to basic sanitation.
- Reinforce follow-up and evaluation.
- Use participatory approaches to provide hygiene education in the community.
- When developing a hygiene awareness programme, take into account the specific problems of each village (villages may suffer primarily from lack of food, for example, or show resistance to adopting good hygiene habits).
- Encourage the training of women in rural areas in techniques for constructing SanPlat latrines.
- Encourage the changing of the cultural norms that make the men financially responsible for household improvements (though not the building of the family home itself). The women in rural areas are better able to pay because they work year round: they grow crops, raise animals, run small businesses, and consequently are somewhat better off than the men, who work only during the three months of the rainy season when they cultivate the fields. 

Contributions, please: school sanitation and hygiene education

We are planning a special *WATERfront* issue on integrated school sanitation and hygiene education programmes for publication in 2000. If you have an interesting project you wish to write about, please contact Lizette Burgers, WES Section, UNICEF New York, lburgers@unicef.org.

Fluoride in water: An overview

Briefing note compiled by Jingjing Qian (WES Section, UNICEF New York) with contributions from Dr. A.K. Susheela (Director, Fluorosis Research and Rural Development Foundation of India), Arun Mudgal (WES Section, UNICEF India) and Greg Keast (WES Section, UNICEF New York)

Throughout many parts of the world, high concentrations of fluoride occurring naturally in groundwater and coal have caused widespread fluorosis—a serious bone disease—among local populations. We purposely fluoridate a range of everyday products, notably toothpaste and drinking water, because for decades we have believed that fluoride in small doses has no adverse effects on health to offset its proven benefits in preventing dental decay. But more and more scientists are now seriously questioning the benefits of fluoride, even in small amounts. This paper gives a brief introduction to fluoride issues, particularly as they relate to the quality of drinking water.

Basic facts about fluoride

Fluoride exists fairly abundantly in the earth's crust and can enter groundwater by natural processes; the soil at the foot of mountains is particularly likely to be high in fluoride from the weathering and leaching of bedrock with a high fluoride content.

According to 1984 guidelines published by the World Health Organization (WHO),¹ fluoride is an effective agent for preventing dental caries if taken in 'optimal' amounts. But a single 'optimal' level for daily intake cannot be agreed because the nutritional status of individuals, which varies greatly, influences the rate at which fluoride is absorbed by the body. A diet poor in calcium, for example, increases the body's retention of fluoride.

Water is a major source of fluoride intake. The 1984 WHO guidelines sug-

gested that in areas with a warm climate, the optimal fluoride concentration in drinking water should remain below 1 mg/litre (1ppm or part per million), while in cooler climates it could go up to 1.2 mg/litre. The differentiation derives from the fact that we perspire more in hot weather and consequently drink more water. The guideline value (permissible upper limit) for fluoride in drinking water was set at 1.5 mg/litre, considered a threshold where the benefit of resistance to tooth decay did not yet shade into a significant risk of dental fluorosis.²

In many countries, fluoride is purposely added to the water supply, toothpaste and sometimes other products to promote dental health. It should be noted that fluoride is also found in some foodstuffs and in the air (mostly from production of phosphate fertilizers or burning of fluoride-containing fuels), so the amount of fluoride people actually ingest may be higher than assumed.

It has long been known that excessive fluoride intake carries serious toxic effects. But scientists are now debating whether fluoride confers any benefit at all.

Fluoride: good or bad for health?

Fluoride was first used to fight dental cavities in the 1940s, its effectiveness defended on two grounds:

- *Fluoride inhibits enzymes that breed acid-producing oral bacteria whose acid eats away tooth enamel.* This observation is valid, but some scientists now believe that the harmful impact of fluoride on other useful enzymes far outweighs the beneficial effect on caries prevention.

- *Fluoride ions bind with calcium ions, strengthening tooth enamel as it forms in children.* Many researchers now consider this more of an assumption than fact, because of conflicting evidence from studies in India and several other countries over the past 10 to 15 years. Nevertheless, agreement is universal that excessive fluoride intake leads to loss of calcium from the tooth matrix, aggravating cavity formation throughout life rather than remedying it, and so causing dental fluorosis. Severe, chronic and cumulative overexposure can cause the incurable crippling of skeletal fluorosis.

Symptoms of fluorosis

Dental fluorosis, which is characterized by discoloured, blackened, mottled or chalky-white teeth, is a clear indication of overexposure to fluoride during childhood when the teeth were developing. These effects are not apparent if the teeth were already fully grown prior to the fluoride overexposure; therefore, the fact that an adult may show no signs of dental fluorosis does not necessarily mean that his or her fluoride intake is within the safety limit.

Chronic intake of excessive fluoride can lead to the severe and permanent bone and joint deformations of skeletal fluorosis. Early symptoms include sporadic pain and stiffness of joints: headache, stomach-ache and muscle weakness can also be warning signs. The next stage is osteosclerosis (hardening and calcifying of the bones), and finally the spine, major joints, muscles and nervous system are damaged.

Whether dental or skeletal, fluorosis is irreversible and no treatment exists. The only remedy is prevention, by keeping fluoride intake within safe limits.

1. 'Fluorine and fluorides', *Environmental Health Criteria 36*, IPCS International Programme on Chemical Safety, WHO, 1984. The WHO guideline values for fluoride in drinking water were reevaluated in 1996, without change, and the issue is currently under further review.

2. The WHO guideline value for fluoride in water is not universal: India, for example, lowered its permissible upper limit from 1.5 ppm to 1.0 ppm in 1998.

Fluorosis worldwide

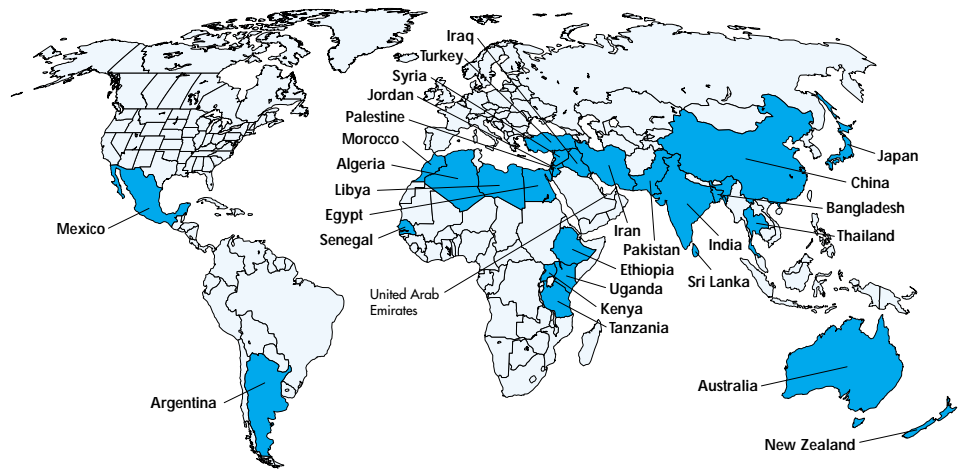
The latest information shows that fluorosis is endemic in at least 25 countries across the globe (see map). The total number of people affected is not known, but a conservative estimate would number in the tens of millions. In 1993, 15 of India's 32 states were identified as endemic for fluorosis.² In Mexico, 5 million people (about 6% of the population) are affected by fluoride in groundwater.³ Fluorosis is prevalent in some parts of central and western China, and caused not only by drinking fluoride in groundwater but also by breathing airborne fluoride released from the burning of fluoride-laden coal.⁴ Worldwide, such instances of industrial fluorosis are on the rise.

Some governments are not yet fully aware of the fluoride problem or convinced of its adverse impact on their populations. Efforts are therefore needed to support more research on the subject and promote systematic policy responses by governments.

Fluoride in water

Since some fluoride compounds in the earth's upper crust are soluble in water, fluoride is found in both surface waters and groundwater. In surface freshwater, however, fluoride concentrations are usually low—0.01 ppm to 0.3 ppm.

In groundwater, the natural concentration of fluoride depends on the geological, chemical and physical characteristics of the aquifer, the porosity and acidity of the soil and rocks, the temperature, the action of other chemical elements, and the depth of wells. Because of the large number of variables, the fluoride concentrations in groundwater can range from well under 1 ppm to more than 35 ppm. In Kenya and South Africa, the levels can exceed



Countries with endemic fluorosis due to excess fluoride in drinking water

25 ppm.⁵ In India, concentrations up to 38.5 ppm have been reported.⁶

Preventing fluoride poisoning

Fluoride poisoning can be prevented or minimized by using alternative water sources, by removing excessive fluoride from drinking water, and by improving the nutritional status of populations at risk.

Alternative water sources

These include surface water, rainwater, and low-fluoride groundwater.

Surface water. Particular caution is required when opting for surface water, since it is often heavily contaminated with biological and chemical pollutants. Surface water should not be used for drinking without treatment and disinfection. Many water treatment technologies are available, but the most effective are usually too expensive and complex for application in poor communities. Simple and low-cost technologies, such as sand filtration, ultraviolet water disinfection or chlorine water disinfection, are adequate in some but not all cases. Community capacity is an essential factor in ensuring successful utilization of these technologies. Water chlorination at household level is widely used only in emergencies.

Rainwater. Rainwater is usually a much cleaner water source and may provide a low-cost simple solution. The problem, however, is limited storage capacity in communities or households. Large storage reservoirs are needed because annual rainfall is extremely uneven in tropical and subtropical regions. Such reservoirs are expensive to build and require large amounts of space.

Low-fluoride groundwater. Fluoride content can vary greatly in wells in the same area, depending on the geological structure of the aquifer and the depth at which water is drawn. Deepening tubewells or sinking new wells in another site may solve the problem. The fact that fluoride is unevenly distributed in groundwater, both vertically and horizontally, means that every well has to be tested individually for fluoride in areas endemic for fluorosis: extrapolating sample tubewell tests to a larger area does not provide an accurate picture.

Defluoridation of water

There are basically two approaches for treating water supplies to remove fluoride: flocculation and adsorption.

Flocculation. The Nalgonda technique (named after the village in India where the method was pioneered) employs this principle. Alum (hydrate aluminium salts)—a coagulant commonly used for water treatment—is used to flocculate

2. *Prevention and control of fluorosis in India*, Rajiv Gandhi National Drinking Water Mission, 1993.

3. 'Endemic fluorosis in Mexico', *Fluoride*, vol. 30, no. 4, 1997.

4. Data from a national research project under the eighth Five-Year Economic and Social Development Plan, 1995.

5. 'Fluorine and fluorides', see note 1 above.

6. Information supplied by UNICEF India.

continued on next page

fluoride ions in the water. Since the process is best carried out under alkaline conditions, lime is added; bleaching powder can also be added to disinfect the water. After a thorough stirring, the chemical elements coagulate into flocs that are heavier than water and settle to the bottom of the container. The operation can be carried out on a large or small scale, and the technique is suitable for both community or household use. One household version uses a pair of 20-litre buckets, with a settling time of one hour and not more than two hours: after coagulation and settling are complete, the treated water is withdrawn through a tap 5 cm above the bottom of the first bucket, safely above the sludge level, and stored for the day's drinking in the second bucket.

Adsorption. The other approach is to filter water down through a column packed with a strong adsorbent, such as activated alumina (Al_2O_3), activated charcoal, or ion exchange resins. This method, too, is suitable for both community and household use. When the adsorbent becomes saturated with fluoride ions, the filter material has to be backwashed with a mild acid or alkali solution to clean and regenerate it. The effluent from backwashing is rich in accumulated fluoride and must therefore be disposed of carefully to avoid recontaminating nearby groundwater.

Both the community and household defluoridation systems have pros and cons. Defluoridation equipment connected to a community handpump is theoretically cheaper per capita than a household unit because of economies of scale; but ensuring proper maintenance of a commonly owned facility is often problematic, so good community organization is necessary. The household units are more convenient for filtering the small amounts of water intended for drinking only, and people usually take better care of them; but an extensive and efficient service system is required to ensure that the filters are replaced or regenerated at the right time. Technology is only part of the issue: local capac-

ity building, including entrepreneurial capabilities, can be a far more critical and difficult task.

Better nutrition

Clinical data indicate that adequate calcium intake is clearly associated with a reduced risk of dental fluorosis. Vitamin C may also safeguard against the risk. In consequence, measures to improve the nutritional status of an affected population—particularly children—appear to be an effective supplement to the technical solutions discussed above.


Defluoridation and UNICEF

UNICEF has worked closely with the Government and other partners in defluoridation programmes in India, where excessive fluoride has been known for many years to exist in much of the nation's groundwater. In the 1980s, UNICEF supported the Government's Technology Mission in the effort to identify and address the fluoride problem: the Government subsequently launched a massive programme, still under way, to provide fluoride-safe water in all the areas affected.

Over the past five years, UNICEF's focus in the India programme has been on strengthening the systems for monitoring water quality, facilitating water treatment by households, and advocating alternative water supplies when

necessary. Education—both of households and communities—is key to the strategy. A number of demonstration projects have been initiated in fluorosis-affected areas, with the emphasis currently on introducing household defluoridation. UNICEF has also sponsored research and development on the use of activated alumina for removal of fluoride from water.

Since fluoride must now be considered an issue of worldwide importance, the years of experience in India should help UNICEF and its partners provide four types of assistance towards an eventual solution:

- Promoting a better understanding of the problem and its impact on children;
- Raising the awareness of relevant governments and the public on the fluoride issue in particular and the importance in general of monitoring water quality;
- Demonstrating, through pilot projects, the efficacy of low-cost fluoride removal technologies;
- Strengthening community and government capacity for fluorosis prevention, including a credible system for risk assessment that comprises both water quality monitoring and health monitoring. 


■ The Night Mitch Hit from page 4

many months after Mitch's departure.

Immediately after the emergency and throughout the recovery period, it has been the organized families, villages and *barrios*, schools and universities that have sustained Honduran social infrastructure. With their strong base in community consultation and responsibility, village water boards and other groups provided the fastest response, even before central Government was able to regroup and mobilize assistance nationwide.

The new spirit of community organization is impacting everything from national politics to village sanitation. Tegucigalpa's new mayor, Vilma Castellanos, who took over from her late

husband, notices the change: "Since Mitch, many *barrios* have organized their own sanitation committees and rubbish collection. We hear from more and more of them, saying they are ready for the municipality to help them haul away the trash that they are collecting every week now."

The recovery of Honduras demonstrates the vital role of civil society in disasters. All assistance the outside world can provide should be directed at enabling the Honduran people and their community organizations to rebuild their lives and renew their difficult path to development and social equality. There is much to be done, and organized Hondurans are providing a solid social base from which to start. 

Water for Panama's poorest

By Ileana Gólcher, Consultant, UNICEF Panama

“The people in our communities have always been reluctant to participate in activities that seemed to offer solutions, because the solutions never happened, or they happened only for a select group of people. They all refused to even fill out the survey questionnaires. ‘Why bother,’ they said, ‘since it never solves our problems.’ But with this water and sanitation project, things are different.... The answers have already been given, and some aqueducts and water pumps have already been built.”

The speaker is Alvaro Rodríguez, voluntary health worker in Horconcos, in the province of Chiriquí. The Municipal Water and Sanitation Project, an initiative in Panama's 15 poorest districts, has been very well received by its beneficiary populations, located mostly in indigenous areas such as eastern Chiriquí, Bocas del Toro, northern Veraguas, Darién and Kuna Yala.

A brief history

The project was inspired by a regional programme—in the area where Guatemala, Honduras and El Salvador share



Playing with the new water supply: children of Chiriquí

borders—which is backed by the European Union and the Central American Parliament and managed by the regional subministry for water and sanitation services; the communities collaborate directly with the authorities to find ways of meeting their basic needs.

Encouraged by the success of the regional programme, UNICEF Panama, with the support of the Spanish and Basque Committees for UNICEF and the Central American Parliament, called on the Panama Government to form a commission to establish the new water project as a joint undertaking with community leaders, local authorities, and community members.

Water for low income communities

To find out how the project was progressing and to hear the views of the inhabitants, we visited several localities in eastern Chiriquí. These areas are hard to reach. A case in point is the village of Soloy (San Félix district), almost two hours away from the Panamerican Highway—a place one reaches slowly in a four-wheel-drive vehicle, skirting

precipices and bumping over all sorts of obstacles in order to lurch forward on a narrow, deeply rutted dirt road. In winter the road conditions are so bad that it is virtually impossible to travel from one village to another.

The population practises subsistence agriculture. Their income is too low, and so are their levels of health and education. Without the basics of electric light and potable water, they have managed to survive by what amounts to real heroism. They belong to

the Ngobe and Buglé ethnic groups, and they have to trek many kilometers to reach a river or ravine for water.

The social and health surveys carried out as part of the project revealed serious need. For example, in the 48 communities of Remedios district, 48% of the population lacks access to latrines;

...in the 48 communities of Remedios district, 48% of the population lacks access to latrines; people defecate in the mountains and rivers. These are the same rivers that supply the communities' drinking water.

people defecate in the mountains and rivers. These are the same rivers that supply the communities' drinking water, which indicates that more than half the population could be consuming highly contaminated water.

The consequences are predictable—communities suffering frequent sickness from gastrointestinal, respiratory and nutritional problems. In 1995, four of the 40 districts of eastern Chiriquí were declared social emergency zones: San Lorenzo, San Félix, Tolé and Remedios.

Three different surveys have made it possible to identify the cultural patterns influencing environmental and health practices. Information was also obtained on the current state of aqueducts and the chances of the communities involved being able to meet the conditions for developing workable drinking water systems.

The surveys showed current water coverage—in Chiriquí, much lower than the national average—and provided the basic information needed for environmental and health education at commu-

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Women's achievement in Chiriqui: one of the new water taps

nity level. The project budget was calculated at \$1.8 million for building 86 aqueducts and 488 water pumps to reach a population estimated at 31,000.

Following the standard procedures established by the Ministry of Health, World Bank and UNICEF, and taking into account the current conditions of the target population, it was decided to build aqueducts for communities of 25 households and up, while communities of fewer than 25 households would be served by a water pump. Since the coordinating team's fieldwork indicated that the mountainous terrain and poor road conditions would add to the difficulties and also raise the costs for construction materials, equipment and transport, gravity-feed aqueducts were chosen as the most practical option.

These technical decisions are considered to render the water schemes cost-effective in terms of capital outlay and benefits to the target population.

Capacity-building and participation workshops

The different levels of community organization have always been the greatest obstacle encountered by project managers in Panama's rural areas. Paternalism, combining with villagers' traditional passivity and sense of dependency, has created a tendency for projects to be organized from outside by external tech-

nical experts, who would interpret the situation according to their own point of view and would then design and impose solutions which were ultimately rejected by the communities. Recognizing this pitfall, the strategy developed by the Municipal Water and Sanitation Project singles out community participation as the key factor in guaranteeing the project's success.

So it was that 664 people—both municipal and local authorities, and community members—took part in a series of 13 workshops to raise awareness. Over several months, the workshop participants learned about

strengthening existing institutions, new techniques of community organization, and how to involve community groups in carrying out surveys. Additional workshops were organized to train local leaders how to identify water sources and employ low-cost technologies for supplying water; how to build small gravity-feed aqueducts; how to draw up construction plans for water storage and

Paternalism, combining with villagers' traditional passivity and sense of dependency, has created a tendency for projects to be organized from outside by external technical experts, who would interpret the situation according to their own point of view and would then design and impose solutions which were ultimately rejected by the communities.

rainwater harvesting; and how to use handpumps. Gender workshops were also developed, and all the communities involved wrote a collective account of their community history.

The workshops made it possible for community leaders to carry out surveys (based on a total 3,127 questionnaires) of 145 communities with aqueducts and 405 communities without.

Felipe Palacios Rodríguez is one of the indigenous voluntary sanitation workers who received training. Felipe lives in Plan de Chorchá, a village four hours' walk away from Soloy. With his wife María, a community midwife, at his side, he tells his story with great satisfaction:

"For me this has been a great experience, because we were able to help provide a service to the community through the different water schemes. We have carried out surveys in villages that do not have water and given them the information on how to obtain it.

"I learned how to use an altimeter, an instrument I always carry with me nowadays, and now I can locate water sources where we can build aqueducts. I am happy because I designed the Plan de Chorchá aqueduct myself, and now we will have water for more than 50 people."

The women organize

In Panama, women play a fundamental role in the family and could be said to be the hub around whom all the most important decisions revolve. Accordingly, the new project involved women in the entire process.

The task was not easy, particularly in those indigenous areas where for cultural reasons women have always been excluded. But tradition need not prevail, says Macarina Bejerano, Soloy village deputy:

"The community is more than ready to contribute and to collaborate with the project teams, so that people come to value water and protect it well. We women have been active participants. I have organized them and spoken with them so that we all know we are an important part of the community and its solutions."

Bejerano's legendary leadership and tenacity have been key in motivating her

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The risk to groundwater supplies from on-site sanitation

By the ARGOSS project team—research scientists working in the British Geological Survey and the Robens Centre for Public and Environmental Health, United Kingdom

The potential for on-site sanitation to cause significant pollution of groundwater has been known for many years. These impacts have led various workers to suggest minimum safe distances separating latrines and groundwater sources. In truth, the impact on groundwater from on-site sanitation is likely to be site-specific and therefore a universal minimum safe distance is unlikely to be appropriate. Such an approach would be over-cautious in some environments, which may adversely affect the ability of communities to improve the quality of the environment within which they live.

Although some contamination of groundwater may be derived from on-site sanitation, should this preclude its use in vulnerable areas? Many workers have pointed out the potential health benefits of improved sanitation and highlight the fact that the risks of *not* improving sanitation, particularly in high-density low-income communities, may outweigh the risks of groundwater pollution.

There is clearly much debate associated with this topic, a debate that can be encompassed by the following series of questions:

1. What is the extent and nature of contamination of groundwater caused by on-site sanitation?
2. What level of priority should be given to protecting groundwater quality in relation to sanitation improvement?
3. How can contamination from on-site sanitation be limited?
4. What implications does groundwater contamination have for water supply technologies?

Ongoing research

An ongoing research project, funded by the UK's Department for International Development, is attempting to address the first of the questions above. The project, entitled 'Assessing Risk to Groundwater from On-site Sanitation' or ARGOSS, is being carried out by the British Geological Survey and the Robens Centre for Public and Environmental Health, in collaboration with a network of researchers in Africa, Asia and Latin

...the risks of *not* improving sanitation, particularly in high-density low-income communities, may outweigh the risks of groundwater pollution.

America. The project will result in a major scientific review of the topic. In addition, a manual of guidelines will be produced for fieldworkers involved in water supply and sanitation programmes to aid the siting of on-site sanitation in relation to groundwater sources.

Whilst the types of pollutant that may result from contamination of groundwater by on-site sanitation are well known, it has often proven difficult to quantify the degree of contamination that has occurred. As part of the project, two major case studies are being carried out in Bangladesh and Uganda. These have provided some interesting results to date on the extent and nature of contamination of groundwater.

Bangladesh

The case study in Bangladesh centres on two peri-urban areas of Dhaka on an

alluvial aquifer. The potential for contamination of groundwater supplies has been identified by sanitary surveys carried out at 100 borehole sites: 95 out of 100 boreholes have a pit latrine within 15 m, with two latrines within 15 m as the average, and 38 of the boreholes have a pit latrine within 5 m. However, results to date do not indicate that serious microbiological contamination of the groundwater is widespread; most boreholes sampled show faecal indicator bacteria (*see endnote*) to be absent or in low numbers, with serious contamination present only sporadically.

Where contamination has occurred it is most likely to have moved to the borehole via more direct routes—e.g. inadequate or deteriorated well headworks—or through the use of polluted water for pump priming, a widespread practice. It is possible that pit latrines could be a source of contamination. Though it is unlikely that the pathogens could survive for the time it would take them to move from the pit latrine through the body of the aquifer to the screen of a borehole, it is possible that they could reach breaks in the borehole casing through lateral movement of leachate at shallow depths, particularly where the unsaturated zone beneath the latrine is thin and the permeability of shallow layers is high. The hand-operated drilling method used extensively in Dhaka precludes the installation of a good cement seal behind the casing.

On-site sanitation is also a source of chemical pollution, in particular chloride and nitrate. Analysis of samples from a range of depths at the two sites indicates widespread chemical pollution of the aquifer at shallow depths. It

continued on next page

would appear that the 'front' of modern high-chloride water has not reached the deeper aquifer but in time, as water demands grow and abstractions from these deeper aquifers increase, this situation is likely to change. Of note is the fact that the risk from nitrate in groundwater appears negligible as a result of anaerobic conditions which promote the natural reduction of nitrate to harmless nitrogen gas by micro-organisms present in the subsurface.

Uganda

In Uganda the aquifer of interest is the weathered crystalline basement. The two areas under study, Iganga and Kampala, have contrasting groundwater flow systems.

Iganga, a medium-sized town, is in an area of low topography on a relatively thick layer of shallow weathered rock (~30 m). The majority of the water supplied here is obtained from wells and boreholes. For this study, hand-pumped boreholes are being sampled. The boreholes penetrate to the top of the fractured basement and draw water from storage at the base of the weathered zone which may be regarded as a regional aquifer. Preliminary data demonstrate several important points. Chloride (Cl) and nitrate (NO₃) values are generally high in Iganga compared to rural groundwater, and the ratio of the two suggests the source is likely to be pit latrines. Analyses show a general absence of faecal indicator bacteria—not surprising as the length of time of travel from pit latrine to borehole screen is likely to be greater than the survival time of the bacteria.

Kampala lies in an area of pronounced topography that gives rise to a thin weathered zone. This produces shallow localized groundwater flow systems in the aquifer. Much of the groundwater used in low- and middle-income areas is obtained from protected springs tapping this shallow flow system. In Kampala, two groups of sites are being studied. The first is in an area of high-density population and low income, and the second is an area of low-density population and low-to-middle income, with

urban agriculture a major activity.

- At the high-density population site the springs show high levels of bacteria and also raised levels of nitrate. Sanitary inspections suggest a major pathway for faecal contamination to be direct localized penetration of contaminated waters through damaged or poorly constructed spring protection works. The raised nitrate levels suggest an additional contribution from on-site sanitation.
- At the low-density population site sampling has again revealed the widespread presence of faecal indicator bacteria, but little contamination by nitrate. Sanitary inspection again suggests localized direct contamination but the low population density and rapid groundwater flow systems prevent high nitrate concentrations building up.

Evidence from research suggests that contributions from latrines are less important than other routes of contamination in deteriorating groundwater quality, and therefore concerns over groundwater contamination should not prohibit the development of on-site sanitation.

Although more research is planned, the preliminary conclusion that can be drawn from the work in Bangladesh and Uganda is that, where microbiological contamination of small systems is found, more attention should be placed on improving the protection works and wellheads than on latrine proximity. The work also illustrates how on-site sanitation can be a major contributor to inorganic chemical pollution of groundwater in low-income countries and in particular contribute nitrate and chloride. Nitrate has been linked to stomach cancer and methaemoglobinemia; chloride

does not in itself have any direct impact on health, but may cause rejection of otherwise good-quality water supplies.

Protecting groundwater versus sanitation improvement

A question that was posed at the beginning of this article is what level of priority should be given to protecting groundwater quality in relation to sanitation improvement? Many people point to work that suggests improvement of sanitation provides much greater health gain than improving water quality at sources. The problem is it is often difficult to reliably predict the health gains from individual interventions given the highly integrated nature of the impact of water and sanitation. It is also true that the reasons for improving the water quality at sources often relate more directly to the prevention of epidemics rather than simply health gain. Evidence from research suggests that contributions from latrines are less important than other routes of contamination in deteriorating groundwater quality, and therefore concerns over groundwater contamination should not prohibit the development of on-site sanitation. However, there is a major qualification on the findings of this research because of the uncertainties about the value of indicator bacteria in groundwater (*see endnote*). The indicators used do demonstrate that recent contamination has occurred and therefore pathogens in infective doses are likely to be present. However, we know that some pathogens will survive in groundwater at infective doses for far longer than the indicator bacteria. Sole reliance on current microbiological indicators may not always be sufficient to gauge whether faecal contamination has occurred, specifically in relation to viruses.

We also have to bear in mind the long-term impacts on deteriorating groundwater quality; the effects may not be felt for several years or decades. In the short term, however, we may need to accept that some contamination of groundwater is unavoidable if the health gain from improved sanitation is to be realized.

Strategies to overcome groundwater pollution

Clearly, if we are to limit the degree of pollution of groundwater from on-site sanitation or minimize the impact on the health of the users, we need to consider ways in which this can be achieved. One option is to establish protection areas around boreholes in which on-site sanitation or other polluting activities are not allowed. Whilst providing an adequate separation between water sources and latrines may be relatively easy to achieve in rural areas, this is much more difficult in the high-density informal settlements which form an integral part of many modern towns and cities. Further, as chloride and (in many aquifers) nitrate are conservative in groundwater, the concept of safe-distance protection becomes irrelevant unless the contaminant source is outside the catchment of the borehole or spring, unlikely in these settlements. Here a solution would be to ensure that piped water is accessible and it has been sug-


gested that this would be cheaper than using alternatives to on-site sanitation. Whilst this may be true, there are major problems in making piped water supplies available to informal settlements. Municipal planners may reject such approaches because they feel it would provide formal recognition to what they see as illegal settlement, and utilities may be reluctant to invest in communities with limited security of tenure. The communities themselves may not view piped water access as a priority if alternatives that are lower-cost and socially acceptable are available and if they have limited security of tenure.

We might also examine improvements in water and sanitation technologies. There may be simple ways in which pit latrines may be modified to reduce the risk of microbial contamination or we could consider the options for treatment of groundwater sources at a community level.

In conclusion, it is clear that to overcome the problems associated with the

contamination of groundwater supplies from on-site sanitation there is a need for integrated water and sanitation development and water resource management. One lesson the industrialized world has learned is that ignoring long-term resource issues leads to spiralling costs and loss of resources, things which lower-income countries in the developing world can ill afford to overlook, particularly if they are dependent on groundwater for much of their water needs.

Endnote

The ideal manner of determining the presence of waterborne pathogens would be to analyse the water for the specific pathogens of concern. However, many types of micro-organisms have been shown to be involved in waterborne disease outbreaks. It is impractical to look for every potential pathogen, so faecal indicator bacteria are used as a warning of possible contamination. 

■ Water for Panama's Poorest from page 15

community to organize the building of their aqueduct. Her fellow villagers say nothing deters her, not even the long distances she must travel to encourage the neighbours to play their part and haul building materials free of charge.

They have formed a water board to manage and maintain the aqueduct. A small charge to households—25 or 50 cents—will make it possible to recover some of the costs and carry out repairs or extend construction.

Today, the villagers of Soloy enthusiastically await the arrival of water through their aqueduct, one of a network of 12 aqueducts due to go into operation this year in their area.

Water and a healthy environment for all

Throughout eastern Chiriquí the project has had to surmount numerous difficulties, including the widely dispersed populations, impassable roads, and many long years of community apathy.


Project coordinators Clementina Gaytán and Dante Ramalli sum up the problems and the successes achieved so far:

In Panama, women play a fundamental role in the family and could be said to be the hub around whom all the most important decisions revolve. Accordingly, the new project involved women in the entire process.

“In the beginning, when we first started visiting the communities, everyone thought the project was just one more empty promise. When we returned to those same communities less than eight months later to build the aqueducts and water pumps with their help, the response we got was total: great interest and participation;

everyone committing to the project and hauling the construction materials from the collection points to the building sites near their homes. These communities are beginning to grow and the households are uniting in group solidarity, now that they know for certain that their aqueduct is coming.”

The villages of eastern Chiriquí are benefiting from a project to meet one of their most important needs—healthy living conditions, especially for their children. Before winter comes, say the very poorest of the villagers, they have agreed to work together to find more ways to improve health and upgrade their communities.

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Honduras: Wastewater treatment in poor urban neighbourhoods

By Johannes Vijlbrief and Niels Willemsen, Delft University of Technology, Netherlands, and Anna Maria Mooijman, WES Section, UNICEF New York

The ‘Tegucigalpa model’ for water supply in peri-urban areas, after eight years of bringing safe water to the city’s poor, embarked in 1995 on a second phase: improving hygiene conditions by the installation of low-cost sewerage systems. The first experiences with these small-scale systems have been positive, and more are planned for the future. In the meantime, however, the extra wastewater generated by the new systems is polluting the environment: in cooperation with the Delft University of Technology, a study was undertaken between May and July 1998 to investigate the possibilities of small-scale, low-cost solutions to the problem.

Background

During the last days of October 1998, the violent waters of the Choluteca and Chiquita rivers caused great damage in Tegucigalpa. Swollen by the heavy rains of hurricane Mitch, the rivers rose many meters above their normal level, washing away bridges and whole neighbourhoods of the Honduran capital. The devastation of human lives and property shocked the world, and prompted many to provide essential medical, logistical and financial assistance.

Adding to the direct losses claimed by the fierce torrents, several water-borne and other diseases emerged soon after. With 21,000 people crowded into makeshift shelters, lacking drinking water and sanitary facilities, diseases like diarrhoea, respiratory infections, cholera and dysentery made their appearance. Fortunately, the quick and effective response of the authorities, assisted by international support, averted large epidemics: for more detail see the article by Anthony Brand in this issue.

Even under normal circumstances,

the rivers of Tegucigalpa were already heavily polluted with organic material and pathogens. The city does not have a plant for treating sewage, and all the sewage collector pipes discharge directly into the rivers. In the dry season when the rivers run low, the water is virtually undiluted sewage, making the rivers unsuitable for any other use.

Water and sanitation in the barrios

More than 400,000 people live in the poor urban areas of Tegucigalpa. Since 1987, UNICEF and SANAA, the Na-

Although the sewerage systems will have a direct positive impact on health conditions in the barrios, the overall impact on the environment is negative. The untreated sewage water is disposed of in the rivers, simply moving the problem elsewhere instead of solving it.

tional Autonomous Water and Sewer Service, have been implementing a joint programme to improve health conditions in the *barrios*. So far, the programme has been very successful. The initial goal—installing safe drinking-water facilities in every *barrio*—has almost been reached. It is estimated that by the year 2000 every community in Tegucigalpa will have a water system providing water up to 34 times more cheaply than the private water vendors. The success of the programme can be partly explained by the unique approach

towards community management and cost recovery. Many articles have been published on the programme, generally known as the ‘Tegucigalpa model’; see for example *WATERfront* issues 1, 8, 11 and 12.

Since 1995, the focus of the programme has been gradually shifting from the provision of drinking water to sanitation. The increased water availability resulting from the newly installed drinking-water systems has led to increasing problems with wastewater. Moreover, no provision has been made for the ‘grey water’ that has been used for washing and runs freely onto the streets causing unhygienic situations. The only sanitary facilities available, though not everywhere, are VIP latrines. Many of them are not used or are used improperly, because of lack of knowledge or aversion to inconveniences like smell and flies. Another problem is the lack of space to relocate the latrines once the pits are filled up (Honduras does not have a tradition of pit emptying). In poor urban settings this space is seldom available.

In 1995, the Executing Unit for Barrios in Development constructed its first sewerage projects using low-cost technologies—either a simplified standard design or a small-bore design (solids settled on site in a septic tank, with only fluids discharged through 4-inch pipes). These demonstrated that the installation of sewerage systems in the *barrios* is both technically and financially feasible, and now many other neighbourhoods are applying for their own system.

The wastewater problem

Although the sewerage systems will have a direct positive impact on health conditions in the *barrios*, the overall impact

on the environment is negative. The untreated sewage water is disposed of in the rivers, simply moving the problem elsewhere instead of solving it.

In 1997, the nation's first water quality law set quality standards for wastewater discharged into surface waters. In theory this means treating all sewage water before discharge, but as mentioned before, sewage has yet to be treated in Tegucigalpa, so it would be an understatement to say that the law is not yet fully implemented. The city's master plan for sanitation includes plans for a large-scale sewage treatment plant downstream, but because of financial constraints this will probably not be built in the foreseeable future.

The sewerage systems installed so far in the *barrios* have all been connected to the existing main collector pipes. But because of capacity problems in the collector network, this cannot be done for all the sewerage systems planned under the programme. Moreover, the *barrios* are often sited in inaccessible locations far from the main collectors, which makes connection, even when physically possible, very expensive, and still does not solve the pollution problems. To investigate the possibilities for independent treatment at community level, a study was undertaken by two students at Delft University of Technology.

Constraints and opportunities

The *barrios* are generally located on steep hillsides and ravines. The lots are small, and the houses cramped together. Few open spaces are available. It is difficult to find an appropriate vacant site for a treatment plant.

Furthermore, the financial plight of the urban poor does not allow the use of expensive technologies, since the construction costs will be partly covered by the community. The treatment systems must be robust, cheap, and easy to operate and maintain with minimal training.

But the uneven topography of the *barrios* also has an advantage: gravity can be used to handle the flow of wastewater through the treatment plants.

Possible technologies

Stabilization ponds. These ponds, in which the wastewater is treated by bacteria and sunlight in natural processes, are the best technology for treating wastewater in tropical climates. The method has many advantages: the ponds are cheap, easy to construct, operate and maintain, and very effective. However, they require a lot of space, which is not available in Tegucigalpa.

...besides the good examples, there are also many sewage treatment plants that function poorly or not at all. Almost without exception, this is caused by the insufficient technical knowledge of the operators, or by the insufficient attention given to durability in the design.

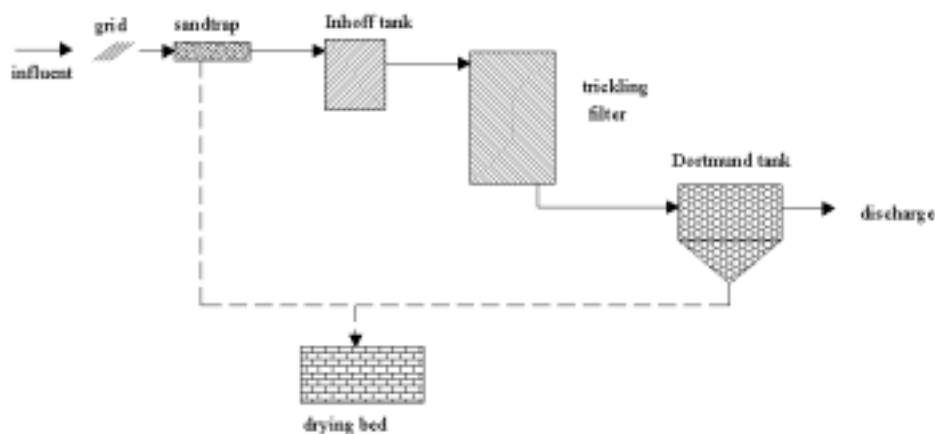
Artificial wetlands. These wetlands (or helophyte filters), another technology that has proven successful in Nicaragua and the Honduran city of San Pedro Sula, cannot be used in Tegucigalpa, again for lack of space. In these wetlands the polluting components are extracted from the wastewater by plants that use them as nutrients. These can be floating plants, but also bottom-rooted plants like bamboo. In a helophyte filter this principle is combined with a filter me-

dium in which the plants root. A bonus is that the plants can be harvested and sold: since any fast-growing plant can be used, a saleable species can be selected to generate some income.

Upflow anaerobic sludge blanket (UASB) reactors. This is a more sophisticated system that treats the wastewater using a blanket of sludge in suspension on which bacteria grow. The conditions in a UASB reactor have to be constantly monitored to create the ideal conditions for certain types of bacteria. In Brazil, small-scale reactors have been successful in treating industrial wastewater. The advantages of this technology are its compactness and the production of gases that can be reused as fuel. The obvious disadvantage is that it requires fairly expert knowledge and skills, and consequently carries high operation and maintenance costs.

Trickling filters. A technology that is relatively compact, simple and requires little maintenance is the trickling filter. This is a cylindrical bed of coarse rock or other material over which the wastewater is sprinkled: a thin film develops on the rocks, consisting of slime in which bacteria grow that take up biodegradable components from the percolating water. Sizes vary, but a filter bed might be 10 m in diameter and 2.5 m deep. Because the bacteria need oxygen, the filter bed must never be covered by water, and the water should be aer-

continued on next page



The pilot plant design.

Headlining sanitation in Uganda's newspapers

By Agnes Bitature, Project Officer, Sanitation, UNICEF Kampala

'Sanitation News' is the title of a regular feature on sanitation carried by two of the nation's leading English-language newspapers, *The Monitor* and *New Vision*, and a vernacular daily, *Bukedde*. The full-page feature first appeared in April 1999 in *The Monitor*. Now all three newspapers have undertaken to run it twice a month for a year, as part of a mass media campaign to give sanitation the high profile it currently needs in Uganda.

The idea for 'Sanitation News' sprang from the realization that unless the movers and shakers of the country are informed and educated about sanitation – especially the fact that it is a responsibility for all and not just a private affair – sanitation will continue to lag behind, always the last of the priorities when human and financial resources are allocated.

The news feature has a children's corner, and sections for cartoons, practical tips, and readers' letters. Contributions are welcomed from all readers, but people working in the areas of sanitation



and health are encouraged to contribute regularly.

The print run for *The Monitor* is about 20,000 copies, reaching some 200,000 people, and about 35,000 copies for *New Vision*, reaching about 280,000 people. The cost to UNICEF of supporting materials development for a year's worth of 'Sanitation News' is estimated at roughly \$33,000, to be shared between the Water and Sanitation Section and the Communication Section.

A special push on sanitation is planned for October 1999, to be launched by the President. The activities will include widespread distribution of leaflets, posters, and children's games and puzzles.

The communication strategy as a whole has made extensive use of market research and testing: the mini-manuals on hygiene promotion that have emerged from this process supply the guidance for putting the strategy into practice.

A particular concern is improving sanitation in schools, which has really deteriorated with the increased enrolments from the Government's drive towards universal primary education. Although most schools have some form of latrine, the numbers fall well short of the need, and quality is poor: in a recent mini-survey it was found that only 2% of schools had adequate latrines

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■ Honduras: Wastewater Treatment from previous page

ated by sprinkling it from a height several metres above the filter bed. Trickling filters need very little maintenance, especially when the water is dripped over the filter bed by stationary sprinklers instead of rotating ones. In El Salvador, experiments with trickling filters using only gravity have been very successful.

All these technologies perform well in removing organic pollution, but only the stabilization pond removes enough pathogens to have a full impact on public health. For optimal pathogen removal using the other technologies, chemical disinfection of the effluent could be considered, but of course that is quite costly.

Sewage treatment plants in other

Central American countries have used most of these technologies with positive results. It is, however, important to recognize that besides the good examples, there are also many sewage treatment plants that function poorly or not at all. Almost without exception, this is caused by the insufficient technical knowledge of the operators, or by the insufficient attention given to durability in the design. Many of these plants are designed and financed by international donors: the design is often based on experience in industrialized countries rather than the conditions existing in the beneficiary country, and the plants are supplied as a complete package without looking at the needs and capabilities of the beneficiaries. Moreover, the operators are rarely

given enough training in the skills for operation and maintenance. To ensure durable proper functioning, a clear operation and maintenance manual, and a training programme for operators, should be integral parts of any designs for treatment plants.

The pilot plant

After a thorough study of the pros and cons of each technology in the Tegucigalpa context, it was concluded that a trickling filter was the most promising. A pilot plant was designed, to test this proposition in practice. Construction was planned for 1999, but has been deferred for reconstruction works after hurricane Mitch.

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Sanitation consumers in Benin: Understanding the market

By Marion (Mimi) Jenkins, Research Engineer, Department of Civil and Environmental Engineering, University of California at Davis; formerly WES Officer, UNICEF Cotonou, Benin

The sanitation community now recognizes the need for a more demand-focused and household-centred approach to sanitation promotion and programming. On a concrete and practical level this means that before we can develop strategies and design programmes, we need to understand the ‘market’ for sanitation and the behaviour of household consumers in that market. This article summarizes some findings from research on how consumers make their sanitation choices and the factors that generate or suppress demand for improved sanitation (Jenkins 1999a). The research uses consumer theory to understand the decisions of households to install a latrine in central Benin, West Africa, covering over 500 communities, from small towns to isolated villages.

Most of the limited research on demand for sanitation has looked at willingness-to-pay (WTP) for a particular sanitation product or service (Whittington et al. 1993; Altaf 1994; Altaf and Hughes 1994). While providing information on the potential demand that might be expressed by consumers for a particular product or service, contingent valuation studies of WTP tend to limit diagnosis of weak demand to a narrow focus on cost as the driving issue. They also often miss out on what really *drives* consumers’ choices and why many are unwilling to pay. By failing to integrate the issue of cost with a host of other factors that influence consumers’ preferences and choices regarding sanitation in developing countries, these studies can leave us with few if any strategies to stimulate demand apart from reducing cost. In contrast, consumer behavioural approaches to studying demand go deeper into the attitudes and beliefs, motives and preferences that determine an individual’s

choice, revealing many possible and interlinked strategies to stimulate demand on local and regional scales, some examples of which are included later in this article.

The key elements of the research framework used to analyse a consumer’s choice to install a latrine consist of *drives* and *constraints*. A drive is the desire for change that motivates the decision to install a latrine or adopt a sanitation product or service. Drives are the underlying reasons why consumers choose to

Prestige, convenience, comfort, and safety were the most widespread reasons for desiring a latrine. The prevention of infectious diseases was a small component....

change their sanitation situation or behaviour and are best understood as a ‘dissatisfaction from a perceived difference between an *ideal* (or desired) state and the *actual* state’. Ideal states reflect personal values and individual lifestyle differences, and include such things as comfort, convenience, privacy, prestige, status, health, safety, religion or ideology, and cleanliness, for example. Actual states reflect individuals’ physical and social environments and circumstances. Unless a person is dissatisfied to a sufficient degree with some aspect of his or her life in relation to something they value, they are unlikely to feel any reason to change behaviour. This is, of course, true for any significant change in behaviour.

Thus, to understand sanitation demand, we must begin by asking, “What

are the drives that motivate consumers to choose new or improved sanitation?” In rural Benin, the research revealed 11 different drives shown in Table 1, representing prestige and well-being values and two particular situations. Household heads with aroused prestige drives were the most likely to install a latrine, followed by those with aroused convenience and comfort drives. Prestige, convenience, comfort, and safety were the most widespread reasons for desiring a latrine. The prevention of infectious diseases was a small component of the drive to protect family health and safety. While this desire contributed to some households’ decision to adopt sanitation, preventing infectious diseases was the least important of the perceived health and safety concerns, and infectious disease transmission was misunderstood.

The action of *constraints* makes up the other element of consumer sanitation choice. Constraints are factors that, when negative, act to hinder or prevent adoption. By contrast, when such factors are positive for an individual, they facilitate adoption as long as drives are aroused. The research framework identified four types of constraints on latrine adoption shown in Table 2, with examples from Benin. Lack of awareness and misunderstanding act early in the decision process, preventing consumers from recognizing latrines as a potentially satisfying solution to their aroused drives. Psychosocial constraints tend to act later, creating negative attitudes toward latrines that reduce preference. Implementation-related constraints, if severe and perceived as permanent, act early in the decision process, making latrines appear completely infeasible as an option. When less severe or perceived as temporary, implementation-related constraints act later in the decision

process, delaying a consumer's decision to adopt until the constraint can be overcome or accommodated, which sometimes requires many years. Operational and performance constraints also act later in the decision process, often for consumers with better awareness and understanding of latrines. Perceptions of poor operation or performance can reduce preference, delay adoption, or cause a consumer to actively reject latrines in favor of a competing option. Interestingly, options that compete with latrine installation in the decision to adopt improved sanitation in Benin and elsewhere often have nothing to do with sanitation and involve other housing-related investments.

The most important constraints on latrine adoption in Benin relate to awareness, understanding, implementation (finance difficulties and technical complexity), and operation/performance (smell and safety). Extended family/social interaction, a psychosocial constraint, was a contributing reason for latrine rejection by some consumers. In

...lack of finance, the ability to acquire the lump-sum capital needed to build a latrine, is a widespread reason for so little latrine installation and a major barrier for many motivated households....

the research, high cost was measured separately from lack of finance (cash/credit) to install a latrine, an important distinction from a policy perspective. The results strongly show that lack of finance, the ability to acquire the lump-sum capital needed to build a latrine, is a widespread reason for so little latrine installation and a major barrier for many motivated households who wish to install a latrine. The finance problem is critical in expressed demand for many water and sanitation projects in developing countries and shows up in studies

continued on next page

Table 1 Drives motivating private latrine installation in central Benin

Value category	Drive	Key dissatisfactions and concerns
Prestige	Affiliate with the urban elite	Hospitality for important guests; avoid shame or embarrassment when urban visitors need to use the toilet
Prestige	Express new experiences and lifestyle acquired outside village	Achieve the 'good' life; bring urban amenities back to village; differentiate oneself from others
Prestige	Leave a legacy for children and descendants	Secure post-mortem status; maternal instinct; obligations to/from descendants in voodoo beliefs
Prestige	Aspire to Fon ^a royal class status	Seek symbols of status/privilege formerly exclusive markers of royal class
Well-being	Increase or maintain cleanliness	Perceived overload of faeces around house, flies, smell; difficulty finding a place free of faeces to defecate; desire for greater order/control over home environment and members
Well-being	Protect personal health and safety (from supernatural dangers)	Avoid supernatural dangers associated with seeing/smelling faeces, seeing a snake in bush, evil spirits at night; protect faeces from theft by enemies who want to use it in sorcery
Well-being	Protect family health and safety (from mundane accidents and dangers, infectious diseases)	Concern for family members getting bitten by snakes and other accidents/problems using the bush that cause lost time, expense, social conflicts; fear of crime at night; avoid diseases spread by faeces left in the open
Well-being	Increase convenience and comfort	Avoid long distances, rain, hot sun, to reach open defecation sites; bush is uncomfortable, dirty, disagreeable; hassle of social conflicts from defecating on wrong site from limited choice of sites
Well-being	Increase visual, social, or informational privacy	Difficulty finding defecation sites with visual privacy; uncomfortable mingling (outsider) in public; want privacy for possessions, activities, wives; restrict personal information
None: situational ^b	Ease restricted mobility	Old age, blindness, illness, etc. make it physically difficult or impossible to defecate in bush
None: situational ^b	Increase rental income	Renters pay more for unit with latrine

a. The dominant ethnic group in the study area, where voodoo is the dominant cultural religion.

b. These situational drives are largely unrelated to value differences and reflect limited functional uses for latrines due to physical impairment or for commercial gain.

where willingness to pay monthly charges is substantial and greater than willingness to pay one-time connection fees (see Singh et al. 1993).

The framework, simply put, states that a sanitation product or service must be possible and a preferred choice for a consumer. Using the framework, weak demand for latrines or other sanitation improvements can be explained by the following causes, where those listed lower on the list are only possible after eliminating ones listed above it:

1. No drive is sufficiently aroused;
2. The sanitation option is not recognized as relevant to the aroused drive/s due to lack of awareness or misunderstanding;
3. The sanitation option is excluded from consideration as impossible because implementation-related constraints are perceived to be permanent and prohibitive;
4. Negative attitudes toward the sanitation option, induced by the action of psychosocial constraints or perceived poor performance of the option in terms of outcomes for drive satisfaction, compounded by low implementation feasibility, make the option less preferred than a competing non-sanitation alternative; and
5. Latrines are preferred but the temporary presence of constraints, mostly implementation-related, cause an individual to do nothing (delay choice) or choose another option.

This diagnosis of rejection has clear implications for identifying many fruitful strategies to stimulate demand, as demonstrated by the ideas at the end of this article. It also means that multiple strategies must be used to stimulate demand for different potential consumers. A single strategy to make latrines more affordable, for example, will have little or no effect on consumers who have no aroused drives, who misunderstand latrine technology, who perceive serious performance problems, or who lack access to the capital or technical support needed for latrine installation.

Design and selection of strategies to correct causes of weak demand must be targeted to appropriate groups of consumers based on the drives and constraints that operate for each group. In consumer talk, these groups are often called 'market segments' and are thought of as somewhat homogeneous groupings of potential consumers for purposes of developing 'consumer-appealing' products and effectively tar-

geting advertising messages, communication techniques, promotional efforts, and product information.

In the analysis for Benin, households and villages in the study area were categorized into market segments, based on similar latrine adoption drives and constraints, in order to develop appropriate targeted strategies for stimulating demand. Individual lifestyle differences based on such indicators as gender,

Table 2 Constraints blocking latrine installation in central Benin

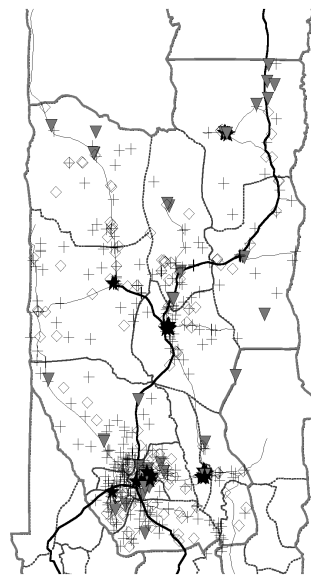
Examples in Benin	Constraints related to:			
	Awareness	Implementation	Psycho-social	Operational/performance
Lack of awareness	■			
Misunderstandings	■			
Bad soil/water table conditions for pit		■		
Lack of space		■		
Technical complexity/inaccessibility (skilled labour, expertise, special tools or materials needed and hard to get)		■		
High cost		■		
Lack of cash/credit (finance)		■		
Poor latrine design and performance (smell, structural and child safety)				■
Lack decision-making capability		■	■	
Adhere to/identify with social norms (fear disrupting social relations)			■	
Extended family interaction problems			■	
Family or village disapproval of latrines			■	
Psycho-physical aversion to latrines (intolerance of feces, fear, conditioned to open defecation)			■	
Perceived benefits of open defecation (fertilize soil, fresh air, social interaction, privacy, feed pigs)			■	

occupation, lifecycle stage (age and household structure), mobility and travel, social linkages, education, and wealth were used along with such village conditions as availability of open defecation sites, social structure heterogeneity, level of regional integration, isolation and information/technology exposure and access, and exposure to latrines, to identify the likely presence or absence of different drivers and constraints explaining latrine adoption behavior in Benin.

Each community segment requires different strategies, resources, and phasing of actions to stimulate demand for latrines. Computer mapping using the GIS system (Geographic Information System) played a key role in both the analysis and mapping of market segments and village conditions for stimulating demand (Jenkins 1999b). It also provides a useful tool for planning, monitoring, and evaluation of marketing programme actions.

Some key policy implications of the research to stimulate demand for latrines and increase adoption in rural Benin included the following:

- Promotional messages should reflect the cultural values that underlie the real advantages consumers seek in choosing to install latrines and draw attention to the inadequacy of present physical/social conditions in terms of these same advantages and values.
- Prevention of infectious diseases is not an effective motivator of latrine adoption and should not be used to try to promote consumer demand. While cultural notions of good health can be used in latrine promotion, separate long-term public health educational programmes, especially in schools, should focus on increasing understanding of infectious disease transmission and its prevention.
- A single set of promotional messages, communications strategies, and latrine 'products' is unlikely to work for all segments of the population, given that the underlying motives



Market Segments of Communities for Sanitation Promotion
Zou Province, Benin

- ★ High Density, Socio-economically Diverse
- ▼ Large, Agricultural, Integrated
- ◇ Smaller, Integrated, Less Accessible
- + Smallest, Socio-economically Homogenous, Remote
- Department
- Sub-prefecture
- Major paved roads
- Secondary roads

GIS map of market segments for sanitation promotion in central Benin. The map pinpoints the locations of the four market segments of communities for latrine promotion on a regional scale identified from the 500+ communities studied.

that drive demand for sanitation are neither homogeneous nor static across households.

- Technical design enhancements to the odour production, structural integrity, and safety (especially for children) of latrines are needed in Benin and must be developed, dis-

A single set of promotional messages, communications strategies, and latrine 'products' is unlikely to work for all segments of the population, given that the underlying motives that drive demand for sanitation are neither homogeneous nor static across households.

seminated, and publicized through operational research, training of private-sector latrine builders, and consumer informational campaigns.

- The single most effective supply-side strategy to stimulate demand for latrines in Benin may well be some

kind of finance scheme to provide credit to households for latrine construction. Carefully targeting such schemes to consumers with a strong preference for latrines who lack capital, is a necessary condition for their success.

- GIS is a helpful tool to identify the location of communities having favourable latrine demand-stimulating conditions. These communities can serve as 'diffusion' centres for surrounding communities/neighbourhoods in the start-up of a marketing programme.
- Bundling the promotion of latrines and the delivery of construction support activities to highly desired housing improvements may be an effective way to improve the image of latrines and increase access to critical information, resources, and other inputs. Bundling could include such things as offering loans for housing improvements, such as rainwater cisterns in Benin, on condition that household latrines are also built, targeting private builders of these improvements for training and information dissemination on latrine

continued on next page

design and construction, and linking latrines to these highly desired items in publicity campaigns.

The consumer-oriented framework used in this investigation for analysing sanitation choice and the policy implications for market-based promotion are applicable to sanitation demand in any setting, whether rural, urban, or peri-urban, and any technology, from pit latrines to sewer hook-ups. Because urban settings are diverse, market segments requiring different sanitation products/services and promotional strategies will be needed to satisfy and stimulate demand among different population segments. GIS can be helpful, along with community analysis, in mapping and analysing the different neighbourhood environments and sector conditions that affect sanitation demand in terms of the most widely felt drives for improved sanitation and the most critical constraints limiting demand. Lifestyle differences are crucial for understanding the market and these must be understood and uncovered as

well, through dialogue with households, focus groups, attitudinal surveys, product testing, etc. Implicit in these ideas about consumers and the market is the recognition that sanitation is in large part a private consumer good, albeit with important public externalities, and its provision can be achieved efficiently through regulated markets.

Acknowledgement

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■ Honduras: Wastewater Treatment from page 21

When it is built, the pilot plant will have about the same capacity as the future community-scale treatment plants. To avoid serious problems should it fail, a relatively underpopulated site was selected for it—a site near the river Choluteca, just outside a community of 1,200 people where a sewerage project had recently been completed.

The pilot design takes the wastewater down through several stages, using gravity only:

- Pre-filtering through sand to remove solids;
- A standard Imhoff tank (a two-compartment treatment tank with digestion in the upper compartment and settling in the lower);
- A trickling filter with stationary sprinklers;
- And finally, a post-sedimentation tank to remove sludge particles from

the effluent. A sludge-drying bed is also included, so the plant will be completely independent from external services.


The community itself can do the operation and maintenance. The plant runs completely on gravity and has no moving parts. To reduce the investment costs, cheap local materials and local construction techniques are used wherever possible. The construction costs are estimated at \$18,000, or \$15 per person. As with all the construction projects of the Tegucigalpa programme, the community will provide manual labour to reduce the costs of construction even further.

Follow-up

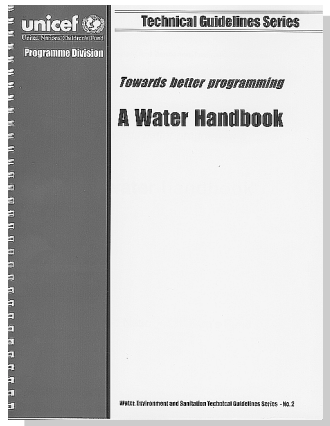
If the pilot project is successful it could be expanded to other communities. But since the conditions will probably vary in each community, the design might

require modifications, or another technology might be more appropriate.

To monitor the overall effects on the environment, it will be important to develop a programme for systematic monitoring of the water quality in the rivers. Although everyone agrees that the water quality is poor, no reliable data exist to prove this or to supply baseline data against which to measure any improvements that may result from the new wastewater treatment plants.

While it makes sense for the city priorities to have shifted to reconstruction works after hurricane Mitch, it would be a mistake to postpone the solving of the wastewater problem for too long. On the contrary, integrated systems for water, sewerage and sewage treatment covering the whole urban water cycle should supply the basis of the reconstruction works, to create a healthy living environment for Tegucigalpa's children and their families. 

New Publications



Towards better programming: A water handbook

Vers une meilleure programmation: Manuel sur l'eau

Hacia una mayor programa- ción: Manual sobre el agua

This water handbook—part of the UNICEF Programme Division technical guidelines series on water, environment and sanitation—is the result of wide collaboration within UNICEF and with its partners, tapping more than three decades of lessons learned from programming for water throughout the world.

The handbook provides a broad overview of state-of-the-art programming for water management, protection and supply. It provides extensive coverage on key sectoral issues such as community management and maintenance of water resources, the need for cost-effective solutions, and, perhaps most importantly, how to promote commitment and involvement in these issues from the very highest levels of government to the smallest communities. The handbook also summarizes the technologies and methodologies applied in UNICEF-supported country programmes.

While *A water handbook* is intended primarily for UNICEF programme officers working in water

management, it should also prove useful to other interested professionals, both in UNICEF and also in government and civil society. The handbook is, above all, a practical guide for implementing UNICEF strategies in water and environmental sanitation. As such it is an important tool for all field professionals working to accelerate progress towards the goals established at the World Summit for Children.

For more information, or to order copies, please contact the WES Section, UNICEF New York, wesinfo@unicef.org.

Vers une meilleure programmation: Un manuel sur l'hygiène et l'assainisse- ment en milieu scolaire

Hacia una mayor programación: Manual sobre saneamiento y higiene en la escuela

These volumes are the French and Spanish editions of A manual on school sanitation and hygiene, featured in the last issue of WATERfront.

This manual, a collaboration between UNICEF and the IRC International Water and Sanitation Centre in Delft, builds on the experience gained from a number of country programmes to advocate integrated approaches towards clean, safe schools for all children. The issue is becoming all the more important as countries move towards universal primary education: if the children entering school today are given the right tools and knowledge, the generations of tomorrow will be better equipped to safeguard their families' and communities' health and environment.

For more information, or to obtain copies, please contact the WES Section, UNICEF New York, wesinfo@unicef.org.

Out in the cold: Emergency water supply and sanitation for cold regions

By Mark Buttle and Michael Smith, WEDC, 1999

During the 1990s, events in the Balkans, the former Soviet Union countries, Afghanistan and northern Iraq have demonstrated that humanitarian disasters are not limited to 'the South', Africa or the tropics, but may strike anywhere in the world. Relief agencies have been tested in ways previously unimaginable. Aid workers have to be ever more adaptable in order to provide life-saving water supplies and sanitation facilities in areas where freezing conditions occur.

This pocket-sized 94-page handbook is intended for aid workers operating in cold or cool temperate regions. It is designed to provide supplementary information that can be used together with the information given in more general emergency manuals.

The handbook is available online at <http://www.lboro.ac.uk/departments/cv/wedc/out/contents.htm>. For further information contact the Water, Engineering and Development Centre (WEDC), Loughborough University, Leicestershire LE11 3TU, UK, or e-mail WEDC@lboro.ac.uk.

“The time for action is now”

By Colin Davis, Chief, WES Section, UNICEF Ethiopia

Short version of a presentation at the conference on “Integrated development for water supply and sanitation” organized by WEDC (Water, Engineering and Development Centre, University of Loughborough), Addis Ababa, 30 August 1999

The UNICEF ECC programme (Early Childhood Care for Survival, Growth and Development) is a cross-sectoral approach with a holistic strategy to address the child’s *right* to survival, protection, care and development. From a UNICEF programming perspective, the ECC focus would be on:

- family conditions and practices
- community conditions and practices
- social policies
- laws and institutions
- cultural values and beliefs.

UNICEF takes the ECC approach as a major new thrust of its programming with the following rationales:

- *A social rationale:* Child development should be put at the front end of human development—first things first. The Convention on the Rights of the Child says that the child has a right to develop to the “maximum extent possible”.
- *A scientific rationale:* There is no longer any doubt that the early years in a child’s life are critical in the formation of intelligence, personality and social behaviour.
- *A programmatic rationale:* If children develop better in their early years, education programmes directed to them later on will have greater impact, and health programmes and services will have a better chance of sustainable success.
- *Force of numbers:* More children are surviving today than was the case in the past. However, they are surviving in the same conditions of poverty and stress: growing urbanization,

industrialization, the spread of conflicts and the relentless spread of HIV/AIDS all mean there is a growing imperative for new forms of attention to the way in which children grow and develop. With HIV/AIDS especially, if there is to be a ‘window of hope’ it is by working with the young children.

- *A firm base:* There is a synergism between health status, nutritional status and psychosocial well-being. Too many programmes have, in the past, perhaps been too monofocal in design, lacking the integration that would have so enriched and encouraged a sustainable and improved output.

In support of the ECC approach, there is perhaps a new and greater urgency than ever before, a challenge—the promotion of programme integration. In this, families and communities should, as a right, have access to information and services affecting care practices, health, nutrition, hygiene, sanitation, education and socialization.


Integration is a critical programming element in creating an enabling environment. Fostering a child’s development by better programme integration will positively affect the child’s survival and growth. Where absolute integration of programme delivery is difficult, then convergence of programmes in families and communities which have been identified as being most in need should be a priority.

The title of this, the 25th WEDC conference, is “Integrated development for water supply and sanitation”. The importance of integrating these two vital services is being stressed; it has perhaps never been more urgent to ensure that integration, or at least convergence, actually takes place. There is no doubt that sanitation lies at the heart of human dignity and is essential, along with safe water supply and hygiene, for the preven-

tion of about one quarter of all preventable deaths among children every year.

At a major workshop on environmental sanitation and hygiene which was held in June 1998 at UNICEF New York, a number of recommendations for action were made, some of which are:

- Stimulate and support governments to develop national policies for sanitation and hygiene.
- Access to sanitation in schools, especially for girls and female teachers, is a priority.
- Advocate community-based financing initiatives.
- Develop a communication framework to promote good sanitation and hygienic practices among children and care-givers. Implement this framework throughout the primary education period as part of an early childhood care and protection programme.

The time for action is now. The need for early childhood care and development, in a programme of sanitation and hygiene education and as a right for children everywhere, has never been greater. You are urged to consider this as you participate in this WEDC conference over the next five days. 

WATERfront

A newsletter for information exchange on Water, Environment, Sanitation, and Hygiene Education


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