World Water Day 2004
Water and Disasters

The burden of disease associated with inadequate or poorly-managed water supply and sanitation systems can be dramatically increased when natural or human-made disasters occur. Contaminated or otherwise broken water supply systems have a direct, and potentially devastating, impact on the health and livelihood of disaster-affected persons. Often the most vulnerable populations—including children, refugees and other marginalized groups, and the poor—bear the brunt of these impacts, suffering increased morbidity and mortality.

This year, World Water Day (22 March) is dedicated to “Water and Disasters”. The Day offers a unique opportunity to bring attention to the health dangers that arise from broken water supply systems and sanitation facilities during a disaster/crisis situation. The Day provides a platform for mobilizing political will and encouraging decision-makers around the globe to promote and adopt preparedness and mitigation measures and improve response, rehabilitation, and reconstruction.

In commemoration of World Water Day 2004, Issue 19 of Health in Emergencies highlights water supply and sanitation experiences in select disaster/crisis situations. Experts from UNDP Tajikistan, Oxfam Iraq, UNICEF Liberia, the Health Protection Agency (UK), the Pan American Centre for Sanitary Engineering (Peru), AMRO/PAHO Colombia, and WHO/Geneva have contributed articles. This issue of the newsletter has been co-produced by the departments for the Protection of the Human Environment (PHE) and Health Action in Crises (HAC), WHO/Geneva.

Overview
Water Systems in Disasters
José Augusto Hueb, Water, Sanitation and Health, WHO/Geneva

Natural and human-made disasters—including floods, hurricanes, droughts, earthquakes, violent conflicts, chemical spills, and sudden economic downturn—can dramatically affect the systems that people rely on for day-to-day survival and productivity.

Natural disasters and water

According to the World Meteorological Organization, weather and climate-related extreme events—such as tornadoes, thunderstorms, storms, cyclones, floods and drought—account for nearly 75 per cent of all disasters. They lead to an enormous amount of human suffering, loss of life, ill-health and economic damage. Monitoring these events, predicting their movements and issuing timely warnings are essential to mitigate their potentially disastrous impact on the population and economy.

Too little water: droughts. Droughts cause more ill-health and death than any other natural disaster because, besides denying access to adequate water supplies, they exacerbate malnutrition and can trigger famine. Diarrhoea and malnu-
Water and Disasters - Leading Off

Water and disasters are the biggest killers in drought. The increased presence of vector-borne and infectious diseases adds to the burden of disease. In Venezuela and Colombia, malaria cases increased by more than one-third following dry periods associated with El Niño/Southern Oscillation (ENSO). A four-fold increase in malaria was documented in southwestern Sri Lanka during ENSO. Drought has a major impact on infection because there is less water available for drinking and for personal hygiene. Studies have shown that, in times of shortage, people tend to use water for cooking rather than for hygiene. This increases the prevalence of diseases such as trachoma and scabies. In droughts, people are more likely to risk drinking unsafe water. Drought is a major cause of death worldwide and accounts for approximately half of the victims of natural disasters.

Too much water: floods. Floods are the second most frequent cause of natural disasters, after windstorms. Flooding increases the ever-present health threat from inadequate drinking-water and sanitation systems. Water supplies, especially unprotected wells and surface water sources, can become contaminated with industrial waste, refuse dumps, and sewage. The early health effects of floods include death through drowning, being crushed by landslides or collapsing buildings, and accidents such as falls or electrocution. As drinking water supply and sanitation systems can be damaged, flooding poses a further health threat. Sanitation is a major problem in all flooded areas. The combined effects of open sewage and reduced opportunities for good personal hygiene favor the spread of infections causing diarrhoea, such as cholera and gastrointestinal viruses. In tropical countries, the floodwaters provide an ideal breeding ground for mosquitoes and an increased risk of diseases such as dengue, malaria and Rift Valley Fever. Floodwaters also displace rodent populations, which may cause human outbreaks of leptospirosis and hantavirus infection.

Vital systems and lifelines

Each community depends on a variety of systems for the circulation of people, goods, services and information. The number and complexity of these systems are functions of the socio-economic development of the community. Some of them, though, are vital for any community’s mere survival, let alone its health, safety and economic activity. They are sometimes called essential services, sometimes ‘lifelines’. The water supply system is one of these.


Human-made disasters/crises and water

Violent conflict—which is increasingly targeting civilians and characterized by the destruction of key infrastructure, the burning and looting of private and public goods, and the threat of biochemical warfare—can leave millions of people without access to safe water and adequate sanitation. Damaged water infrastructure undermines relief efforts, as in the case of water supplies needed for the functioning of hospitals, etc. Disruption of water systems may also cause displacement. Settlements of internally displaced persons and refugees demand specific and immediate attention for the establishment of adequate water supply and sanitation systems. Relief/rehabilitation work to ensure the provision of water supply and sanitation services are frequently obstructed by unsurmountable security concerns.

Dramatic economic downturn or collapse—often resulting in a socio-economic crisis accompanied by civil unrest—can lead to the deterioration of national, provincial, and/or local government or private sector capacity to maintain water supply and sanitation systems. Degraded systems are more vulnerable to the effects of natural hazards (such as floods, earthquakes, etc.) and systemic contamination. In addition, malfunctioning systems have high opportunity costs and can perpetuate poverty. For example, people (disproportionately women) spend hours in line to get water, often at the expense of income-generating or educational activities.

Chemical contamination of water supplies can be caused by sudden events (industrial spills/explosions or bioterrorism) or slow onset crises (like the Arsenicosis in south Asian communities or mine runoff contamination of water sources). Either can reap havoc on water supply systems and seriously jeopardize the users.

• Flooding in the Horn of Africa in 1997, associated with ENSO, caused an upsurge in cholera deaths due to the lethal combination of damaged sanitation systems and contamination of water supplies.
• During flooding in Bolivia and Peru in the mid-1980s, increases in diarrhoeal and acute respiratory diseases were recorded.
• In Ghana in 2000, severe floods led to the pollution of more than 200 dams, wells and boreholes in the West Region by tons of untreated human and industrial waste. Floodwater had also submerged refuse dumps. The costs of the flooding were magnified by the need to resettle people and to rehabilitate polluted dams.
• Lack of access to adequate sanitation and drinking water during the floods in Mozambique in 2000 put nearly 800,000 people at increased risk of infectious diseases.


How to manage water systems in disasters?

Disaster management requires a continuous chain of activities that includes risk reduction (prevention and mitigation), preparedness, emergency response, relief and recovery, as well as activities to reconstruct infrastructure (especially water and sanitation facilities) and rehabilitate shattered lives and livelihoods.

Hazard assessment

An exhaustive analysis of all —natural and man-made—hazards in a given area should be undertaken. The elements to be considered are each hazard’s intensity, urgency, manageability and potential area of impact (maps—i.e., “hazard mapping”—are of great help at this stage). Each hazard can damage and disrupt the vital systems including the water supply, and has social and economic implications. The relationship between vulnerability-susceptibility-resilience per each hazard (or a combination of hazards) should be considered.

Vulnerability assessment

Vulnerability assessment makes it possible to anticipate problems that specific groups will face in the event of a disaster and during the period of recovery. The process of vulnerability assessment involves determining the spatial proximity of population subgroups to hazards, according to personal and socioeconomic characteristics that may influence the immediate and long-term impact of hazards on them. Water and sanitation infrastructure would greatly benefit from vulnerability assessments, as priority measures could be effectively taken to reduce the possibility of disruption to these services.

Prevention and mitigation

Complete prevention of damage to water and sanitation infrastructure from disasters is feasible only if it is possible to eliminate people’s susceptibility to hazards by moving populations away from hazard zones, providing complete protection from hazards or preventing the physical hazard altogether. Populations living in unstable zones frequently rely on highly vulnerable water supply and sanitation infrastructure. Unfortunately, to survive or improve their well-being, humans are sometimes forced, sometimes willing to take risks and will even resettle in areas previously affected by disasters. The best that can be done, therefore, is to reduce the potential impact of future events. Mitigation—actions aimed at reducing (but not eliminating) the risks of damage to water and sanitation infrastructure from future hazards—and the reduction of the susceptibility of high-risk groups are then the goals.

Emergency preparedness

Emergency preparedness is a programme of long-term development activities, the goals of which are to strengthen the overall capacity and capability of a country to manage efficiently all types of extreme events by ensuring an optimal recovery from relief to sustained development. For the water and sanitation sector, the aim of preparedness programmes is to achieve a satisfactory level of readiness to respond to emergencies that may affect water and sanitation infrastructure and strengthen the technical and managerial capacity of governments, organizations, institutions and communities to deal with them.

Planning, policy and capacity-building

Planning is required at all levels, from the community level to national and international levels, to ensure that programmes for disaster prevention and mitigation take into consideration the needs of the water supply and sanitation sector. This should be done according to clear objectives, with adequate resources and management arrangements, and to ensure that strategies, resources, management structures, roles and resources for response and recovery are determined and understood by key actors. Effective emergency planning can only take place once roles and responsibilities have been agreed upon.

Table 1: Flood Deaths

<table>
<thead>
<tr>
<th>Year</th>
<th>Location</th>
<th>Deaths</th>
</tr>
</thead>
<tbody>
<tr>
<td>1421</td>
<td>Holland</td>
<td>100,000</td>
</tr>
<tr>
<td>1530</td>
<td>Holland</td>
<td>400,000</td>
</tr>
<tr>
<td>1642</td>
<td>China</td>
<td>300,000</td>
</tr>
<tr>
<td>1887</td>
<td>Yellow river, China</td>
<td>900,000</td>
</tr>
<tr>
<td>1900</td>
<td>Galveston, Texas, USA</td>
<td>5,000</td>
</tr>
<tr>
<td>1911</td>
<td>Yangtze River, China</td>
<td>100,000</td>
</tr>
<tr>
<td>1931</td>
<td>Yangtze River, China</td>
<td>145,000</td>
</tr>
<tr>
<td>1935</td>
<td>Yangtze River, China</td>
<td>142,000</td>
</tr>
<tr>
<td>1938</td>
<td>Yellow river, China</td>
<td>870,000</td>
</tr>
<tr>
<td>1949</td>
<td>Yangtze River, China</td>
<td>5,700</td>
</tr>
<tr>
<td>1953</td>
<td>Holland</td>
<td>2,000</td>
</tr>
<tr>
<td>1954</td>
<td>Yangtze River, China</td>
<td>30,000</td>
</tr>
<tr>
<td>1959</td>
<td>Japan</td>
<td>5,098</td>
</tr>
<tr>
<td>1960</td>
<td>Bangladesh</td>
<td>10,000</td>
</tr>
<tr>
<td>1963</td>
<td>Vaiont, Italy</td>
<td>1,800</td>
</tr>
<tr>
<td>1979</td>
<td>Morvi, India</td>
<td>15,000</td>
</tr>
<tr>
<td>1991</td>
<td>Bangladesh</td>
<td>139,000</td>
</tr>
<tr>
<td>1991</td>
<td>Huai River, China</td>
<td>2,900</td>
</tr>
<tr>
<td>1998</td>
<td>Central America</td>
<td>18,000</td>
</tr>
<tr>
<td>1998</td>
<td>Yangtze River, China</td>
<td>3,000</td>
</tr>
<tr>
<td>1998</td>
<td>India and Bangladesh</td>
<td>2,425</td>
</tr>
</tbody>
</table>


Emergency response

The appropriate response will depend on a combination of factors: the nature of the event, the effectiveness of mitiga-
WATER AND DISASTERS - COUNTRY EXPERIENCES

It was clear that water and sanitation was going to be a major area for concern. War has devastating effects on people’s lives, but as the International Committee of the Red Cross (ICRC) statistics showed in 1994, more people die from drinking polluted water during wartime than from bullets. In

For more information, please write to huebj@who.int.

Basrah: A City in Trouble

Professor Dr Paul Sherlock, Senior Humanitarian Representative, Public Health Engineering Team, Oxfam

The moment the Iraq crisis started to loom on the horizon, it was clear that water and sanitation was going to be a major area for concern. War has devastating effects on people’s lives, but as the International Committee of the Red Cross (ICRC) statistics showed in 1994, more people die from drinking polluted water during wartime than from bullets. In Basrah, between April and June 2003, access to clean water became a matter of life or death.

The city is, in some ways, like a boat tossing around on an ocean, with water, water everywhere but not a drop to drink. All of the water sources in and around Basrah—both rivers and ground sources—are saline. The city’s “sweet water” comes by canal from a source on the Tigris, around 60 kilometres north of Nasiriyah. In addition to Basrah’s population of 1.5 million people, all the small towns in the area—right down to the Kuwait border—are dependent on this sole source of water, pumped to them via a complex system of pipelines and booster stations. Over the years, the system and, therefore, the quality and supply of water has gradually deteriorated.

Basrah was in the front-line during the Iraq-Iran war and suffered serious damage. Subsequently, the electrical power supply that powered Basrah’s systems was severely impaired in the 1991 Gulf War. Then there were 12 years of sanctions, a massive loss of investment and around 60 per cent of the city’s technical expertise emigrated overseas. It’s hardly surprising that Basrah was not in good shape leading up to March 2003. People were driven to buy most of their drinking water from commercial vendors selling RO (Reverse Osmosis) water that had gone through a desalination plant.

Water and sanitation issues have an important role in recovery. They can contribute to the long-term reduction of people’s vulnerability to hazards by increasing their capacity to cope with, and recover from, future disasters. Examples include the reconstruction of housing with improved local drainage and built-in roof water-catchment systems, the reconstruction of markets with adequate facilities for personal and food hygiene, and the repair and deepening of rural wells and boreholes. There will be ample opportunities for long-term improvements during the recovery period, depending on the local situation.

The only power available to pump water to Basrah and surrounding towns came from six standby generators at the pumping site at the end of the sweet water supply canal. Unfortunately, only three of these were in working order. ICRC responded to the crisis immediately and moved to get the other generators working. They also repaired a transmission line that had been damaged in the fighting around Basrah. However, water shortages during and after the war continued and the relief effort had to be scaled up. UNICEF installed pillow tanks sent by UNICEF and others.

By May, security clearance allowed UNICEF to move into Basrah, where people were still very desperate for drinking water. “Bottled RO” water was still available on the streets, but even the quality of that was now suspect. While more agencies moved in and UNICEF took over coordination of water and sanitation from the ICRC, cases of cholera started to be confirmed at the local hospital.
ICRC set up a water testing and chlorine monitoring project with the local water authority staff of several hundred points around the water distribution network. The project concentrated on both primary and secondary lines, and also the household level. The results showed that while chlorine was in the system, it was not taking effect as it was being overcome by pollution. In most cases, it was not having any effect at all on water at the household level. UNICEF took over the monitoring project and worked with WHO to assist in the training of local staff.

As the number of confirmed cholera cases climbed to 45, several international agencies, including WHO, supported local medical staff with equipment and drugs. The situation was soon under control, but tackling the water system was not so easy.

Looting and the breaking into water mains continued and the mains power was still a problem. Summer temperatures were starting to soar. Water tankering from Kuwait continued throughout the summer with more than 100 tankers travelling every day to Basrah and the surrounding towns. Many of the commercial companies (mainly Bectel) at first came to Basrah, but during those initial stages, they seemed unable to make any impact on the situation.

As security deteriorated, work in the water and sanitation sector became progressively more difficult. The bombing of the UN building on 19 August 2003 forced the UN and most of the other main NGOs to pull out of Basrah. At the time of writing, they still have not returned.

As for the water in Basrah, recent reports suggest there has been little or no improvement from last year. Local engineers are doing what they can for now, but major investment is needed for the system to be brought back to 1990 standards. Only then will we start to see clean water flowing in Basrah once again.

For more information, please write to psherlock@oxfam.org.uk.

**Water Access and Management in Tajikistan**

Alan Esser, Senior Programme Officer, Communities Programme, UNDP Tajikistan

**Situation Analysis**

Whether through lack of maintenance or destruction during the civil war, many of the drinking water supply systems in Tajikistan have all but collapsed. As a result, residents must either travel long distances to fetch potable water or, more often, collect water locally from unsanitary ditches, canals or drainage pits. According to UNICEF, only 47% of the rural population currently has access to safe drinking water. This has led to the re-emergence and rise in the spread of waterborne infectious diseases such as typhoid and dysentery. The Government’s Poverty Reduction Strategy Paper indicates that the incidence of these diseases increased by 27% between 1995 and 2000. The problem is particularly acute in rural localities, where poverty rates are the highest.

Budget constraints at the central level mean resources are often unavailable for operation and maintenance of existing infrastructure, rehabilitation of collapsed infrastructure, and regular testing of water quality. Rehabilitation of supply systems by international organisations provides part of the answer. However, without strengthened institutions to maintain and operate systems, test water quality, raise awareness on health and sanitation to change behavioural habits, or institute and manage fee-paying mechanisms, long-term sustainability will remain in doubt.

**UNDP’s Strategic Approach**

This strategic approach is designed to provide deep impact on the living standards of beneficiaries through providing water that is safe to drink; support capacity building of system owners/operators to assist in delivering the best possible service given existing constraints; and training on health and sanitation so that water made available is properly used, stored and handled.

**Rehabilitation: Making clean drinking water available**

Water located at a depth of more than 60 meters below the surface usually belongs to the second aquifer level in Tajikistan and can be delivered to the surface by submersible pumps or deep well hand-pumps. The quality of water accessed here is commonly free from contamination and pollutants and of unvarying quality, contrary to water extracted by shallow well hand-pumps. UNDP only rehabilitates systems that extract water from such depths.

The most common method of decontamination of water is chlorination. All rehabilitated water supply systems are either provided with new chlorination facilities or pre-existing
facilities are rehabilitated. In addition, advice is provided to system owners and operators on the regular and scheduled application of chlorine to maintain water quality throughout the system delivery network.

For all drinking water projects, UNDP promotes the active participation of the Sanitary Epidemiological Stations (SES) to provide disease monitoring and water quality testing. This is done not only to ensure that the water delivered is fit for consumption, but also to simultaneously expand the reach and build the capacity of SES to potentially undertake similar activities in the future.

**System Operation and Management Principles: Contributing to effective planning and management**

UNDP encourages the participation of the system owner/operator in all water supply system projects. To exclude them from project design, implementation and handover would not only jeopardize the sustainability of all project outputs, as the owner is the body legally responsible for operation and maintenance, but would also miss an important opportunity to actively and constructively engage the owner as a partner and concerned stakeholder.

Elaboration of system operation and maintenance principles must be seen in the light of attempting to enhance the planning capacity and effective management of all owners of rehabilitated systems in order to provide the best possible service for users. By constructively engaging owners as partners, assistance can be delivered in such planning and in the elaboration of management principles for sustainable and equitable future use of the system.

Secondly, owners have the legal right to levy fees from water users against the service delivered, a right community-based organizations currently lack under present legislation. Though system owners have been lax in establishing or collecting fees, or in many instances have never collected them at all since independence, they are the only body that has the legal status to undertake fee collection. Therefore, if fees are to be established and collected, engagement of the system owner is crucial to provide a legal basis.

Whether Vodokanal, Selkhozvodoprovodstroy, a Jamoa Administration or a Farm Association, at times the owner does not require the resources—both technical and personnel—to fulfill, or assist in system operation and maintenance. System owners must therefore be engaged, as they often already possess the necessary machinery, equipment and qualified personnel for timely upkeep and operation of the supply systems.

A number of planning exercises are undertaken for the benefit and guidance of system owners and operators of the water supply systems UNDP rehabilitates. These include:

- **System Operation Principles** to assist the owner/operator in planning for seasonal adjustments in the operational routine to provide the best possible service to users. This includes elaboration of summer operations, when electricity will be more reliable, as well as winter operations, when electricity will be infrequent.

- **System Maintenance Principles** to assist owners/operators in planning for regular service activities, annual service activities, and long-term system refurbishment needs.

- **System Operation and Maintenance Costs** to help owners/operators estimate the costs of the activities outlined above.

- **Consultations and Agreement** with beneficiaries and owners to form consensus on all principles outlined above including user fee agreements, taking care to ensure particularly vulnerable families are exempt.

"We did not have clean water in our village at all, so we collected it from ditches. We had to use it for the preparation of food, washing, cleaning and very often we got sick." - Mr. Yusupov, Okarik village, Bobojon Gafurov district, Sughd region.

Almost a year ago, the villagers of Okarik lacked access to safe drinking water. Without a system during the Soviet period, villagers were left with little option but to draw water from unsanitary canals or ditches. The result was that residents, most often children and the elderly, were exposed to infectious water-borne diseases. This placed a disproportionate burden on already strained family finances for medical care to treat diseases like hepatitis, dysentery and acute intestinal diseases.

The community itself identified drinking water as its greatest need, and requested assistance from UNDP in project design and implementation. Residents actively contributed through digging trenches for the pipeline and procured 3 km of the 5 km pipeline, a financial contribution equivalent to about 20-25% of total project cost. With funding from ECHO, UNDP oversaw timely implementation of the project, strengthened capacity of Water User Committee and conducted a health awareness campaign amongst the population.

Now that the project is over, the WUC continues to collect fees from users, a monthly amount of 50 dirams (17 cents). For transparency and accountability, at quarterly intervals the WUC explains to residents at a general meeting how it will use the funds and its future plans.
Collected fees may fall short of covering all system costs given the impoverished state of the rural population. Nevertheless, instituting payment for social services, even if small, can be an important contribution toward sustainability, through small-scale repair and the procurement of spare parts, and may deepen a sense of ownership amongst the local population toward the infrastructure. Proper planning of system operation and maintenance may contribute to those funds that are collected being used in the best possible way.

**Water User Committees: Ensuring community participation**

Given that substantial and regular budget allocations at the central level are unlikely to be forthcoming in the near to mid-term, Water User Committees can make an important contribution to the sustainability of project outputs through a variety of explicit functions. WUCs previously established by UNDP have often been responsible for mobilization of the communities to submit water user fees, have collected those fees, and have undertaken explanatory works amongst the local population as to the necessity of fee payment for the timely upkeep and operation of the system.

Just as importantly, WUCs can also serve as a vital link, both during project activities and after them, to initiate a dialogue between system users and system owners on system sustainability as well as daily operations. Whether to channel fees collected to the owner, to alert the owner about potential or existing problems with the system, to raise any other concerns of users, or to act as a focal point for community mobilization to undertake any necessary manual repairs which can involve local labor, WUCs offer a number of key benefits to drinking water supply projects.

**Health and Sanitation: Fostering behavioural change**

Health and sanitation training is meant to ensure that the water made available through the technical component of all projects is properly utilized. NGOs are contracted, and in some cases, training of trainers initiated, to conduct household level training where the potential for behavioural change can be most immediate, so that all residents serviced by the system will be reached. Training focuses on the types and modes of transmission of waterborne diseases; handling of drinking water; proper disposal of waste water, human excreta and garbage; personal, domestic, and food hygiene. Key partners have been NGOs like Zarshedabonu, the Healthy Lifestyle Centres of the Ministry of Health, and UNICEF, the latter of which has provided training materials—in collaboration with the Ministry of Education—in household sanitation and hygiene.

For more information, please write to alan.esser@undp.tajikiston.com.
After a disaster, it is possible that there is not sufficient water to meet the basic consumption needs of the affected population. In these circumstances, it is important to be able to count on the minimum amount of safe water needed both for survival and to avoid health problems related to inadequate supplies of water (whether from poor hygiene or the consumption of contaminated water).

Access to safe water by the affected population must be ensured in quantities sufficient for consumption, cooking and personal and domestic hygiene. Public water supply points should be near enough to accommodations to permit access to the minimum amount of water necessary. Measures should be taken to avoid the contamination of water during its transport, storage, and provision.

The population should have at its disposal the adequate installations/facilities and utensils to gather, store, and use sufficient quantities of water for drinking, cooking, and personal hygiene, as well as those necessary to protect the water from contamination. Installations are also needed to facilitate bathing and handwashing, and the cleaning of clothing and cooking utensils. Educational programmes should be implemented to ensure hygiene measures that maximize the use of water as an essential resource.

For more information, please write to rore@col.ops-oms.org or jovicr@col.ops-oms.org.

**Liberia – Community Water and Excreta Disposal Reconstruction Priorities**

Nicholas Willson, UNICEF Liberia

In November 2003, the National Transitional Government of Liberia (NTGL), United Nations and World Bank instigated a Reconstruction Needs Assessment for Liberia (RNAL) based around thirteen broad ranging priority sectors. This paper summarises some of the key findings of the Water and Sanitation (WatSan) Priority Sector report with regards to the community managed Water and Excreta Disposal (WatExct) facilities. Included are the priority actions required for the two-year period leading up to elections at the end of 2005.

Fourteen years of war has resulted in the rural population abandoning their homes to seek refuge in and around Liberia’s urban centres. War and poor management have together contributed to: a) the collapse of the state managed WatSan systems, where they existed in the urban areas, and b) widespread theft and damage to rural WatExct facilities.

As a result, the urban populations have had an increased reliance on community and privately owned ground water wells. Few of the urban wells are considered to be free of faecal contamination.

With regards to excreta disposal, the vast majority of urban Liberians rely on pit latrines or toilets connected to septic tanks. However, these are in short supply and this has resulted in a high level of open defecation or defecation into plastic bags that are then deposited onto rubbish heaps or thrown into the open drainage channels. In rural areas, people rely on pit latrines or open defecation for excreta disposal. It is reasonable to assume that many of the rural pit latrine superstructures have been damaged. However, pits and slabs may still exist.

Due to the ongoing security situation and time limitations countrywide, access was not practicable during the RNAL process. The process, therefore, relied on documents and anecdotal evidence. Detailed assessments will be required in each location prior to any work taking place. In all cases, the strategy and project design will emphasise the shared responsibility of State, communities and individuals for improving WatExct facilities.

Due to the limited absorption capacity within Liberia, it will not be possible to answer all of the needs in all locations within the two-year period. Activities will need to be prioritised in areas where there will be the greatest risk and impact of an outbreak of WatExct-related diseases. Resources will need to be used to progressively improve facilities in such a way that environmental, economic, social and technical sustainability are assured. Choice of project areas will be based on cross-sectoral knowledge and, as such, there will be a need for strong sector and inter-sectoral co-ordination and collaboration on activities.

All WatExct community based projects will aim to have initial public health/hygiene promotion activities carried out by the implementing agencies. The longer term sustainable...
improvements in health will only be assured if the work on the physical facilities are backed up by longer-term community based management and public health/hygiene promotion activities. Due to the structure of the RNAL, process these activities have been included within the Health Priority Sector report.

There needs to be a strong focus on capacity-building of communities to enable and empower them to be central in the management, development and operation/maintenance of WatExct facilities within their areas. These activities will ensure that the needs and interests of all minority and marginalised groups are heard and taken into account. This approach will be central to many of the other assistance activities. The WatSan sector will attempt to link into both the State led and Community led structures, rather than developing its own co-ordination arrangements.

Due to the limited agricultural production over the next two years, food will become an issue when considering any physical activities. In this sense food, as a facilitating factor, will be provided to the community members actively involved in the construction of WatExct facilities.

By the end of 2005, WatExct facilities will have been strengthened in main rural areas and seven main urban areas.

General:
• Establishment of a centralised database on the community managed WatExct situation.

Rural areas:
• Rehabilitation or construction of 2,750 wells.
• Rehabilitation or construction of 9,000 drop holes.

Urban areas:
• Regular carrying out of household level water treatment by 75% of the urban population.
• Rehabilitation of 4,400 wells.
• Rehabilitation or construction of 9,880 drop holes.
• Construction of 10 enhanced public sanitation blocks in Monrovia.
• Construction of four water testing laboratories.

The above activities aim to address WatExct issues through a combination of increased public health/hygiene awareness by the population (also covered by the work of the Health Priority Sector), technical repairs to WatExct facilities and a shift towards household treatment of water by the urban population. The shift to household treatment in urban areas will enable the population to take more direct control and responsibility for the water they consume. It is probable that it will be possible for the rural population to maintain a higher level of well water quality such that household level treatment in rural areas will not be required.

In addition to the improvements to community excreta disposal facilities, it is proposed that a pilot project of enhanced pay-as-you-use sanitation blocks (public toilets and showers) is established in Monrovia. If these blocks are a success, then the number may be extended in Monrovia and other urban areas.

Taking into account Liberia’s limited absorption capacity, by the end of 2005, Liberia’s community WatExct facilities and the structures that support them will have been substantially and sustainably improved in key urban and rural areas. These actions will contribute towards creating an environment where people are less exposed to the risks of WatExct related diseases, and are able to live in more dignified and secure surroundings. In turn, these will contribute towards creating a more stable environment in which to hold the elections.

For more information, please write to nickwillson@compuserve.com.

Preventing Chemical Pollution of Water Supplies in the United Kingdom

Davies P.G., Pullin R.A., Russell J.L. Chemical Hazards & Poisons Division (Cardiff), Health Protection Agency, University of Wales Institute Cardiff, UK

The UK is recognised as having a sophisticated water industry that provides safe potable water at a high quality to more than 20 million properties (i.e., the majority of the UK’s population [Water UK 2004]). The industry consists of 1,000 reservoirs, more than 2,500 water treatment works, 9,000 sewage treatment works and more than 700,000 kilometres of mains and sewers [Water UK 2004]. This infrastructure dates back to Victorian times (1837-1901) when a considerable proportion of today’s existing network was constructed. Drinking water quality is strictly regulated with responsibility lying with the Drinking Water Inspectorate (England and Wales), the Scottish Executive (Scotland) and the Northern Ireland Water Service (Northern Ireland).

As a result of the above, the risk of bacteriological contamination and the spread of waterborne diseases are largely a thing of the past. There are exceptions, however, and occasionally resistant micro-organisms such as Cryptosporidium contaminate even mains supplies and cause sporadic outbreaks of illness such as the outbreak of cryptosporidiosis in West Hertfordshire and North London in February/March 1997 where 345 cases were confirmed [Gray 2002]. Chemical contamination incidents of potable supplies are also rare events, but even today these supplies can be vulnerable to pollution by chemical sources such as industrial releases and accidents. The issue of firewater containment is now given
serious consideration at the design stage of industrial installations due to the risk of contamination of water resources following fires at industrial installations.

Most of the water supplied in the UK is from upland resources that are remote from sources of industrial pollution, whilst the potential for contamination of groundwater sources has been dramatically reduced in the UK by the introduction of the Groundwater Directive (EC 80/68/EEC) and the designation of groundwater protection zones [NCSA 2003]. This legislation, the Groundwater Regulations 1998 (SI 1998 No. 2746), protects aquifers from sources of industrial development that have the potential to release aqueous discharges. The Environment Agency, which enforces this legislation, has the power to prohibit any activity that could lead to the contamination of any groundwater resources.

As a result of these strict control measures, there have been very few incidents of chemical contamination of potable supplies in the UK in recent years. There are, however, a number of notable ones, these being the River Dee incident in 1984 involving some 225,000 litres of industrial effluent (mainly phenol) which contaminated the drinking water supply of 2 million consumers; the Lowermoor water poisoning incident in 1988 involving aluminium sulphate which potentially affected 20,000 people; and the Worcester incident in 1994 involving 2-ethyl-5,5-dimethyl-1,2-dioxane (2EDD) which affected 30,000 domestic households; [Altmann 1999, Department of Health 2002, Water Contamination Emergencies Conference 2003]. Probably the most potentially serious incident involving the greatest number of people was the Chernobyl incident in 1986 when the radioactive cloud caused radioactive deposition on upland areas of England, Scotland and Wales. Even today, three hundred and eighty six farms still have restrictions upon their sheep farming activities [Moss 2003]. The common feature, even with the best and most sophisticated control measures in place, is that it is impossible to entirely prevent contamination of water resources through industrial accidents.

Most of these accidents result in acute incidents with the affects being largely transient and normality is resumed within a number of hours or days. Occasionally, however, where actual exposure of a population has occurred, even where the clinical features resolved quickly, chronic sequelae-both physiological and psychological-can be long lasting and persist sometimes for many years. The Lowermoor incident is a classic example of this, where even today some fifteen years on the effects of this incident are still being felt. What this incident illustrates is that even with the most sophisticated control measures in place, simple human error can override all of these safeguards with disastrous effects. In this particular case, twenty tons of aluminium sulphate were inadvertently emptied into the supply post treatment. This accident was compounded by a delay in informing the public of the accident [Altmann 2003]. The incident resulted in reports of rashes and gastrointestinal disturbances within days and later musculoskeletal pains, malaise and impairment of concentration and memory [Altmann 1999].

On a slightly larger scale, the River Dee incident illustrates how an industrial release by a local factory can effectively render a substantial water resource unfit for consumption. In this incident, phenol was discharged into the river and during the water treatment process it reacted with the disinfecting agent chlorine to form trichlorophenol (TCP) [Department of Health 2002]. Initially it was considered that there was no public health risk of consumption of this compound, as it is a mild antiseptic. However, this led to complaints of gastrointestinal symptoms by those who had consumed it.

This brief article illustrates that even though the UK has one of the tightest regulatory control regimes in the world, contamination of potable water through industrial accidents can and do occasionally occur. Fortunately, however, such events are rare and even where control mechanisms do fail, contingency plans held by the water companies ensure that the consumer is adequately protected. Nevertheless, it is important to learn from such events and implement key findings of such incidents into these plans, so that normality of supply is restored quickly and public health is not in any way compromised.

For more information, please write to RPullin@nwic.ac.uk.

References

Reduction of Vulnerability in Water and Sanitation Services in Latin America and the Caribbean

Eng. Claudio Osorio, Pan American Center for Sanitary Engineering and Environmental Sciences³, CEPIS/AMRO-PAHO, Lima, Peru

As a result of the 23 June 2001 earthquake that struck Arequipa, Ayacucho, Moquegua and Tacna in Peru, 48 (14.3%) of the 335 water systems were destroyed and an additional 103 (30.7%) were damaged to some extent.


One of the greatest challenges to sustainable development in Latin America and the Caribbean is to reduce the risk of disasters and their impacts. Drinking water and sanitation systems are among the most affected infrastructure after a disaster strikes. The impact can have catastrophic and unsuspected effects on the health of the population, as well as negative implications for productive processes and economic activities that depend on the continuation of these basic services.

The impact on the physical infrastructure of the systems and the economic losses incurred by water and sanitation utilities further worsen their already critical financial situation. Some of the damage, suspension, and deterioration of water and basic sanitation supply services during disaster situations have particular implications and should be closely monitored. The following should be taken into consideration:

- The availability of drinking water in adequate quantities is vital for responding to a disaster, as well as for medical care, clean-up, fire control, etc.
- The continuity or return to everyday life (including productivity) depends greatly on the re-establishment of services and basic community infrastructure.
- Damage to water and sanitation systems—with implications in the quality, quantity, and continuity—also affects communities that were not directly impacted by the disaster. These communities become part of the “affected population” owing to their reliance on these damaged systems.
- Water and sanitation infrastructure in rural zones affected by disasters usually takes exceedingly long periods of time to be rehabilitated, when compared to urban infrastructure. In many instances, damaged rural infrastructure is simply abandoned by the community because community members are not able to re-establish these services.

• Given the importance of re-establishing services in the shortest term possible, measures are taken to find temporary solutions (rehabilitation) strictly aiming to resume the service. However, the general population and authorities frequently assume that to put the services into operation again means that the problem has been solved. This may result in the postponement (sometimes by years) of needed reconstruction.

Economic impact of disasters on the water and sanitation sector

One example of the economic costs to the water and sanitation sector incurred by disasters is that of the earthquakes in El Salvador in early 2001, which affected more than 200 water and sanitation systems and resulted in damages worth a total of US$ 11 million. In addition, there was an immediate sector expenditure of US$ 400,000 just for the distribution of water using cistern trucks. That amount did not include emergency measures to resume the provision of water in the least possible amount of time. CEPAL estimated that the reconstruction of the affected systems would cost a total of US$ 23.3 million.

Another example is during the “El Niño” phenomena of 1997-1998, where a water and sanitation company that serves approximately one million inhabitants in the Department of Piura, Peru, reported considerable losses. Approximately US$ 4.15 million were spent in emergency operations. The reconstruction programme for damaged systems was estimated at US$ 21.2 million.

Hurricane Mitch

Hurricane Mitch in 1998 was one of the worst recent natural disasters, estimated to have killed more people than any Atlantic hurricane in the last 200 years. More than 3 million people were left homeless and at least 11,000 dead, with thousands reported missing. Floods and mudslides destroyed the entire infrastructure of Honduras and devastated parts of Nicaragua, Guatemala, Belize and El Salvador. As well as the loss of many homes, approximately 4.5 million people in Honduras (75% of the population) were left without access to clean drinking water, around 1500 rural water mains were destroyed. Fever and respiratory illness were widespread and in the following months increases in malaria, dengue and cholera were reported. As a consequence of this damage, the water sector there declined to a level achieved three decades before, in terms of the work done and progress made to achieve universal coverage of such services. Three decades of efforts were lost in one week, and it will take years to reach the levels achieved before Hurricane Mitch.


³ The Pan American Center for Sanitary Engineering and Environmental Sciences, CEPIS/PAHO, is a centre of the Area of Sustainable Development and Environmental Health (SDE) of AMRO/PAHO.
Challenges in disaster vulnerability reduction

The following challenges have been identified by national authorities in Latin America and the Caribbean for disaster vulnerability reduction in the water and sanitation sector.

- To define the risk management functions of water and sanitation institutions responsible for the sector, such as ministries, regulatory bodies, superintendents, and utilities. As well, to ensure the allocation of human, technical, and economic resources necessary to accomplish these functions.

- To prepare technical and decision-making tools for the incorporation of risk management in activities aimed at increasing the coverage and sustainability of services.

- To forge alliances with regional and national organizations—both technical and financial—that take part in the development, planning, and modernization of the water and sanitation sector.

- To work together with academic institutions (universities, research centres, etc.) for information production and exchange of experiences among professionals dealing with the planning, design, and operation of water and sanitation infrastructure.

- To strengthen the capacity of local water and sanitation utilities, including risk management in infrastructure planning.

- To strengthen the capacity of regulatory institutions to include disaster prevention and mitigation measures in standards and regulations for the design, construction, and operation of water supply and sanitation systems.

- To advise governmental and private institutions on the incorporation of risk management in activities and processes related to the decentralization and concession or privatization of water and sanitation services.

- To compile and analyse technical information on the impact of disasters on water and sanitation infrastructure to ensure that rehabilitation and reconstruction projects incorporate measures that reduce the vulnerability to natural hazards.

For more information, please write to cosorio@cepis.ops-oms.org or visit http://www.cepis.ops-oms.org.

Infrastructure Planning Against Disasters

The most economic and feasible way of securing water provision during disaster situations is to locate, design and build infrastructure that takes into consideration the presence of natural threats as conditional factors and assessing the potential impact of these hazards. In a similar manner, infrastructure related to water provision must also incorporate mitigation measures for guaranteeing that these systems will work in said conditions while allowing institutions to address emergencies with all the available resources.

One critical situation that must be taken into consideration is the fact that both technicians and decision-makers in charge of infrastructure planning will not always be able to locate this infrastructure outside of disaster prone areas. This may happen because populations receiving these services are sometimes settled in areas of risk themselves, which represents the “original sin” of any attempt to reduce vulnerability. In fact, on occasion, local authorities “legalize” human settlements located in risk zones by delivering basic services to these areas.

Local authorities should instead use the provision and delivery of these services as a planning tool that will allow them to define safe areas for population settlement. While an integral approach for risk management at the local level is sought, authorities should recognize that some independent sector advances might be made with regard to the tasks of reducing the vulnerability of both communities and infrastructure, which will lead to the synergy needed.

In this manner, and taking into consideration the importance of fresh water infrastructure when addressing both emergency situations caused by a disaster and the recovery phase afterwards, local authorities should include this issue in all their initiatives and promote it, so that they also address issues related to reducing the vulnerability of their infrastructure and securing water provision for the affected population, who would then be able to give more support to authorities in a disaster.
About World Water Day

In 1993, the United Nations General Assembly designated 22 March of each year as World Water Day (WWD), following recommendations of the United Nations Conference on Environment and Development (UNCED, Rio de Janeiro, 1992). All countries in the world were encouraged to promote and commemorate the Day.

WWD provides the opportunity to reflect on the implementation of UN recommendations and appropriate actions for the better management of water resources. Each year, a different UN agency is in charge of celebrating and promoting a new theme related to water. On WWD, many activities are carried out at the country level by government, multilateral and bilateral agencies, the private sector, NGOs and professional organizations. The commemoration of the Day involves mass media outreach; education programmes targeting school children and youth; the publication of awareness-raising materials; and the organization of conferences, round tables, seminars and displays dealing with the conservation and development of water resources, etc.

World Water Day 2004, dedicated to “Water and Disasters”, is being jointly coordinated by the UN International Strategy for Disaster Reduction and the World Meteorological Organization. Water, sanitation and hygiene are especially important in disaster management and are directly related to the health and well-being of every person on this planet. Thus, World Water Day 2004 offers a great occasion to promote better preparedness and effective response to water-related disasters and water issues in disaster/crisis situations.


UN Declares 2005-2015 “Water for Life” Decade

At its 58th session, the United Nations General Assembly agreed to proclaim the years 2005 to 2015 as the International Decade for Action, “Water for Life”, beginning with World Water Day, March 22, 2005. The Water for Life decade sets the world’s goals on “a greater focus on water-related issues, while striving to ensure the participation of women in water-related development efforts, and further cooperation at all levels to achieve water-related goals of the Millennium Declaration, Johannesburg Plan of Implementation of the World Summit for Sustainable Development and Agenda 21.”

The first water decade, which was in the 1980s, brought water to over a billion people and sanitation to almost 770 million. Much more still needs to be done. Safe water supply and adequate sanitation to protect health are among the basic human rights. Today, there are still almost 1.1 billion people who have inadequate access to water and 2.4 billion without appropriate sanitation.


HAC Induction Briefing

WHO’s Department for Health Action in Crises will take its regular Induction Briefings for key staff and partners closer to the field.

The next Induction Briefing, which will be held 26 April - 1 May 2004, will include two concurrent courses. One is a revised induction for key staff and partners based on the new HAC strategy and three-year plan. The other is a Training of Trainers course to create a group of regional staff who are able to conduct future briefings at regional and sub-regional levels. The two courses will run together providing practice for future regional trainers.

This Induction Briefing is the 8th conducted by EHA/HAC in which more than 130 WHO Country Representatives (WRs, EHA/HAC focal points at regional, sub-regional and country levels) and key UN, NGO and funding partners have participated. As part of its new strategy and three year plan, WHO plans to conduct one Induction Briefing in Geneva and two in regions each year for the next three years.

There are a limited number of spaces in the Induction Briefing for participants from other UN agencies, NGOs, donors, etc. Those interested should write to gamhewageg@who.int.
Suggested readings on water and disasters

**Environmental Health in Emergencies and Disasters: A Practical Guide (WHO, 2002)**

Environmental health problems arising from emergencies and disasters are connected to their effects on the physical, biological and social environment that pose a threat to human health, well-being and survival. This book deals with the management of environmental health problems before, during and after emergencies and disasters.


This book was prepared jointly by the WHO Regional Office for the Americas/Pan American Health Organization (AMRO/PAHO) and the International Division of Sanitary Engineering and Environmental Health in Emergencies and Disasters (DIEDE), a technical division of the Inter-American Association of Sanitary and Environmental Engineering (AIDIS). It is a practical guide for developing emergency and disaster plans for these systems.

**The Sphere Project: humanitarian charter and minimum standard in disaster response. (2004)**

The Sphere Project is an NGO and Red Cross/Red Crescent initiative to enhance the accountability of the humanitarian system, primarily although not exclusively, to those persons who have a right to protection and assistance in disasters.

**Manual for Environmental Health Contingency Planning for Floods in the Caribbean.**
www.disaster-info.net/carib/index.html

This manual was prepared by the Caribbean Environmental Health Institute (CEHI) for AMRO/PAHO. It was developed as a follow-up project to a workshop on disaster preparedness and environmental health held in Barbados in 2000, where the need for EH contingency planning guidelines and EH Rapid Needs Assessment tools was identified. The manual provides planning guidelines for Environmental Health units prior to a flood event and in the field as an assessment tool during and after flood events.


Armed conflict, drought, famine and other serious disasters create emergencies in which large numbers of people require urgent help. *Engineering in Emergencies* is a practical handbook for all relief workers involved in giving humanitarian assistance at such times.

For more information, please write to Dr Isis Pluut, Health Action in Crises, WHO, pluute@who.int.
Contacts

Department for Health Action in Crises
World Health Organization
20 Avenue Appia
1211 Geneva 27, Switzerland
Phone: (41 22) 791 2727/2987
Fax: (41 22) 791 48 44
email: crises@who.int
http://www.who.int/disasters

Regional Office for Africa (AFRO)
Emergency and Humanitarian Action
BP 06
Brazzaville
Republic of Congo
Phone: (47) 241 38244
Fax: (47) 241 39501
email: siamevik@afro.who.int
or siamevik@yahoo.fr
http://www.whoafr.org/

Regional Office for the Eastern Mediterranean (EMRO)
Coordination, Resource Mobilization
and Emergency Relief
WHO Post Office
Abdul Razzaq Al Sanhouri Street,
(opposite Children’s Library)
PO Box 7608 Nasr City
Cairo 11371 Egypt
Phone: (202) 670 25 35
Fax: (202) 670 24 92/94
email: musania@emro.who.int
http://www.emro.who.int

Regional Office for Europe (EURO)
Disaster Preparedness and Response Programme
8, Scherfigsvej
2100 Copenhagen O, Denmark
Phone: (45) 39 17 17 17
Fax: (45) 39 17 18 18
email: jth@euro.who.int
http://www.euro.who.int/emergencies

Regional Office for the Americas/Pan American Health
Organization (AMRO/PAHO)
Emergency Preparedness Programme
525, 23rd Street, NW
Washington, DC 20037, USA
Phone: (202) 974 3434
or (202) 974 3520
Fax: (202) 775 4578
email: disaster@paho.org
http://www.paho.org/disasters

Regional Office for the Western Pacific (WPRO)
Division of Health Sector Development
PO Box 2932
1099 Manila, Philippines
Phone: (632) 528 80 01
Fax: (632) 528 9072
email: pesigana@wpro.who.int
http://www.wpro.who.int

Regional Office for South-East Asia (SEARO)
Emergency and Humanitarian Action, Sustainable
Development and Healthy Environments
World Health House
Indraprastha Estate
Mahatma Gandhi Road
New Delhi 11 0002, India
Phone: (91 11) 2337 0804
Fax: (91 11) 23 37 8438
email: perezl@wseoa.org
http://w3.whosea.org/emergency/
WATER AND DISASTERS

© World Health Organization, 2004

All rights reserved.

Publications of the World Health Organization (WHO) can be obtained from Marketing and Dissemination, World Health Organization, 20 Avenue Appia, 1211 Geneva 27, Switzerland (tel: +41 22 791 2476; fax: +41 22 791 4857; email: bookorders@who.int). Requests for permission to reproduce or translate WHO publications—whether for sale or for non-commercial distribution—should be addressed to Publications, at the above address (fax: +41 22 791 4806; email: permissions@who.int).

The World Health Organization does not warrant that the information contained in this publication is complete and correct and shall not be liable for any damages incurred as a result of its use.

The named authors alone are responsible for the views expressed in this publication.

Health in Emergencies is a newsletter of the Department of Health Action in Crises (HAC) of the World Health Organization. In commemoration of World Water Day 2004, Issue 19 has been co-produced with the Department for the Protection of the Human Environment. This newsletter is not a formal publication of WHO.

Production of this newsletter has been made possible by the support of the Italian Government.

Correspondence and inquiries for subscription should be addressed to:

Editor, Health in Emergencies
Department of Health Action in Crises
World Health Organization
20 Avenue Appia
1211 Geneva, Switzerland
Fax: (41 22) 791 4844
e-mail: crises@who.int

Chief Editors (Issue 19): Dr Alessandro Loretti, HAC, and Mr José Hueb, PHE
Editor: Ms Theadora Koller, HAC
Layout (Issue 19): Mr Arvid Ellefsplass