Coping with water crisis in Cuba

A street scene in Veguita de Galo, where water shortages have been most acute. (IDRC Photo: Kevin Conway)

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Pascale Bonnefoy

Over the past ten years, Cuba’s economic decline has led to a slow but steady deterioration of water supplies and sanitation services — and a resulting increase in water-borne disease. When water shortages in parts of Cuba reached crisis proportions last year, two communities solved the problem by taking matters in their own hands — and using slow sand filters as home water-treatment systems.

In Santiago de Cuba, on the eastern part of the island, water shortages made headlines in August of last year. People in some areas of the city, including Veguita de Galo, were doing without water for up to 20 days at a stretch. In other areas, such as La Torre, service was frequently out for four and five days at a time. When water did flow through the city’s mains, it was often on for just two or three hours. To cope with erratic supply, people began storing water, for longer and longer periods, increasing the risk of contamination. Moreover, some residents of Veguita de Galo turned to a private well for water that was turbid, salty and unsafe for drinking.

Even before this most recent crisis the situation was intolerable. A survey revealed that 16 percent of households in Veguita de Galo did not have access to the water-distribution network. Even those that did had to treat their water before it was safe to drink. The region’s facility for producing the chlorine used to treat the municipal water supply had fallen victim to the combined economic shock of the American trade blockade and the fall of the Soviet bloc. A 1999 survey showed that water quality in 49 of the 50 water samples taken in Veguita de Galo was substandard. Cuba’s worsening economic situation also crippled the city`s three wastewater-treatment plants, triggering an increase in water-borne parasitic and infectious disease.

Stored water: Dangerous Stockpiles

To address these problems, with support from Canada's International Development Research Centre (IDRC), a multi-disciplinary research team known as the *Junta Provincial* (provincial council) was created in October 1998 at the Centro Provincial de Higiene y Epidemiología (CPHE) in Santiago de Cuba. Coordinated by the Instituto Nacional de Higiene y Epidemiología (INHEM), the team included an epidemiologist, two family physicians, a

psychologist, two engineers, a chemist, a health-care technician, and a statistician. District councils made up of elected community representatives provided a key local perspective in the research process.

Researchers focused on two areas within the People's Council of Veguita de Galo where the highest rate of water borne disease had been recorded. Of the 924 residents surveyed early on in the project, almost 45 percent did not treat their water. Furthermore, those most directly affected by the poor water quality did not seem aware of the risks involved in using it. The survey also revealed that almost all families stockpiled their water — most often, in any container at hand.

"Contaminated cisterns used to store water are a significant factor in the transmission of diarrheal illness," said Gustavo Marzán, project coordinator in Santiago de Cuba. "Contamination results when cisterns are improperly sealed or micro-organisms on utensils or hands come in contact with the water."

A Solution: Slow-Sand Filters

The main focus of the project was the installation of 703 slow-sand filters and an equal number of containers for the filtered water. This well known, easy-to-use filter technology had been adapted some years ago by a group of IDRC-supported researchers to conditions common in the developing world. Field tests across Latin America proved its robustness. [See related sidebar: From South to North — the sand filter takes hold in Canada, by Colin Campbell]

The filters are based on a centuries-old concept: water trickles through a layer of sand, and living organisms that form a biological layer on the sand's surface purify the water. Easier than boiling water, and surprisingly untechnical, the filters remove nearly all water-borne parasites and bacteria, as well as a high proportion of heavy metals.

Installing Filters: A Family Affair

In January 2000, INHEM turned the production of the filter components over to GEOCUBA, a national firm. Families installed the filters themselves and had to find the gravel and sand that make the filter functional. This, along with washing the sand and gravel and then grading it into different sizes, proved a long process. The first filters were provided to those households lacking water-treatment services where there had been previous episodes of illness. The storage containers were distributed only after it was clear that the filters were working properly.

"The entire population benefitted from the project," stated Hugo Cuevas, a community representative from Veguita de Galo. "It helped reduce diarrhea. It also saved time and fuel, because it was no longer necessary to boil the water and wait for it to cool. It also brought us closer to government institutions, giving us a better idea of what they do and showing us how to work together. Now our relationship is much stronger."

Local Input Shifts Project Focus

The *Agua Segura*, or safe water project, as it came to be called, was launched to evaluate a technology for treating water in the home. However, researchers soon adopted a broader focus and began examining factors in the urban environment that affect human health — in other words, they began taking an ecosystems approach to human health. This approach, which IDRC has pioneered, relies on community participation. Community members identify local health concerns and then work with a multidisciplinary team of researchers to root out the causes. There is almost always a complex mix of social, economic, and cultural factors. In Veguita de Galo, for example, people's

ignorance of the dangers of using untreated water, the crumbling water treatment and water supply infrastructure, the deepening national economic crisis, and the time it took to recognize the problem all affected the residents' health.

The team consequently set two new goals — training for health personnel and community members, as well as the repair of facilities. In total, some 860 households and 3,800 residents participated in the project.

Addressing Root Causes

INHEM began by training members of the provincial commission and district commissions. With support from the Pan American Health Organization in Cuba, two team members attended a workshop in Costa Rica on slow-sand filters. They then passed on this knowledge to other members of the community, including school children. Four people were also trained in microbiological techniques to assess water safety; this group, in turn, trained a community monitoring body.

Water mains were repaired with support from the Canadian Embassy, and 16 defective valves were also replaced to regulate flow, increase pressure, and improve water supply. Other problems related to environmental sanitation, such as sewage discharge through cracked and broken pipes were also solved.

A Collective Undertaking

Making local people an integral part of identifying local health problems and designing and implementing solutions has left its mark on the researchers as well as the community.

"This is the first time a single community has taken part in all phases of a project, from technology implementation through monitoring, from assessment to supervision," underlined Isabel Carbonell, Director of the CPHE and one of *Agua Segura*'s senior coordinators. "Before, we would submit projects and carry them out ourselves. Today, the community can manage and maintain its own projects."

"The population took over the project," added Regla Cañas, senior project coordinator at INHEM and now working with UNICEF in Havana. "We learned to listen to people tell us what they'd do to solve their problems. The community had never participated so directly in a project. The lesson we learned was that the closer we work with the community, the better the results."

Pascale Bonnefoy is freelance journalist based in Santiago, Chile.

For more information:

Vicente Prieto, Instituto Nacional de Higiene y Epidemiologia (INHEM), Infanta No. 1158 e/Llins y Clavel C de la Habana, PO Box 10300, Santiago de Cuba, Cuba; Phone: (537) 78-1479/70-5723; Fax: (537) 33-3973; Email: vicente@inhem.sld.cu

Andrés Sanchez, Ecohealth — Ecosystem Approaches to Human Health, IDRC, 250 Albert Street, PO Box 8500, Ottawa, Ontario, Canada K1G 3H9; Phone: (613) 236-6163 ext. 2113; Fax: (613) 567-7749; Email: asanchez@idrc.ca

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Sidebar

From South to North — the sand filter takes hold in Canada

Colin Campbell

A water filter used widely in developing countries may prove equally popular across North America, and could have prevented disasters like Walkerton and North Battleford, says its inventor.

David Manz, a former civil engineering professor from the University of Calgary, developed a water filter in 1988 to provide cheap, safe, drinking water for communities in developing countries.

Sand — a natural filter

At the heart of the filter was a centuries-old design called the "slow sand filter." The concept: pour water through a layer of sand, and a naturally-forming biological layer purifies the water. The big improvement of Manz's filter was that it didn't require a continuous flow of water to keep the top layer of sand from drying out.

Easier than boiling water and surprisingly untechnical, the design achieved big success overseas. It's used in over 50 countries, says Manz from the Calgary office of his company, Davnor Water Treatment Technologies. Davnor now has a factory in Bangladesh, which has produced about 30,000 filters, and operates in Nigeria and South Africa, he adds. The filters are also used by charities and development agencies like Canada's International Development Research Centre (IDRC), which tested the filter in communities in Chile.

A proven way to purify water

Barney Dutka, recently retired from the National Water Research Institute, tested early designs of Manz's filter. "If it's set up properly, it works quite nicely," he says. Tests showed it removed 100 percent of giardia, 99.98 percent of Cryptosporidium, and over 90 percent of E. coli, says Dutka. Cryptosporidium was the cause of the tainted water outbreak in New Battleford, Saskatchewan, while E. coli was behind the Walkerton water contamination.

"Walkerton problems would not have existed had they put their water through a slow sand filter," says Manz. "You could have had the same operator, quite successfully, and it would never have caused a problem."

Ironing out difficulties

Ironically, a problem with the early models of Manz's filter — used in Chile in the mid-1990s in a project supported by IDRC — led to the discovery that the filter would be useful in Canada. "I got all these calls back from Chile that the filters were plugging up all the time. Nobody could tell me what was going on," says Manz. "And so IDRC flew me back down and it was pretty obvious why they kept plugging up — they were being used for iron removal."

"It was very important to the communities in Chile because they were no longer staining their clothes doing laundry and the water tasted better," adds Manz. Although iron doesn't affect the safety of water, water containing enough iron will stain clothes an orange colour. Iron also happens to be one of the biggest problems with water in Canada — "A *huge* problem all over the world," stresses Manz.

Sand filters on Canadian farms

The filter was modified to remove iron without clogging. "I presented this here in Calgary to a group at the University and they got all excited about iron removal and said 'well could you do that in a farmhouse?' and I said 'well yes, of course we could, this is natural'."

Since then, the filters have been used for almost six years in farming communities across Alberta, as part of a project sponsored by Agriculture and Agri-Food Canada's Prairie Farm Rehabilitation Administration (PFRA). "It's just operating tickety-boo," says Manz of the PFRA project. "Not only do we remove iron now, we know how to remove hydrogen sulfide, iron bacteria, and all the other nasties that you can find in wells."

Use by corporations and communities

The filter has evolved from the simple bucket-like design to include large automated systems. Larger filters are used in a native reserve West of Calgary, and will be used by the oil company Chevron for communities in Nigeria, says Manz.

The filters range in price from about $150 for the smallest, manual models, which filter about 20 litres of water an hour, to almost $250,000 for very large, automated systems capable of supplying water to towns and communities.

Colin Campbell is a freelance writer based in Ottawa.

For more information:

Dr. David H. Manz, President, Davnor Water Treatment Technologies Ltd., 7015 8th Street N.E., Calgary, Alberta, Canada T2E 8A2; Phone: (403) 219-3363; Fax: (403) 219-3373; Email: davnorinfo@davnor.com; Web site: http://www.davnor.com/