

Clean water. A Zulu boy uses a new water dispenser to fill a bucket in one of Durban's semirural settlements.

By providing clean water and improved toilets in "township" settlements, Durban is tackling one of the remaining vestiges of apartheid

Durban's Poor Get Water Services Long Denied

DURBAN, SOUTH AFRICA—Swerving around a muddy puddle in his old Toyota, Lucky Sibiyi cruises past a row of shacks in Cato Crest and stops in front of a postlike water dispenser, where a Zulu man is filling a 10-liter bucket. Nearby, a plastic roof tank is supplying water to the shack below, and, down the street, a woman is adjusting the water flow from a barrel-shaped tank perched on an old tire in front of her home. "That water is clean," says Sibiyi, and for every household, 200 liters a day is free.

Sibiyi advises communities such as Cato Crest—one of Durban's poorest neighborhoods—about how to get the most out of the city's eThekweni Water and Sanitation Unit. Fifteen years ago, when engineer Neil Macleod became head of the unit, Durban's water services reflected the apartheid divide that had split South Africans for decades. The wealthiest residents had First-World water service; the middle third had access to basic water and sewerage; and the poorest third in the slums and semirural areas drew water from muddy streams. Soon after majority rule began in 1994, indigent South Africans began to clamor for the services that they had long been denied. Macleod's department confronted the challenge of rapidly expanding water and sanitation services in "township" settlements while keeping its budget afloat.

At the time, a quarter of a million house-

holds in the Durban area had no access to clean water or sanitation. To jump-start improvements, Macleod got permission from the city in 1996 to provide a daily 200-liter water ration—a policy that became a national goal. Although water dispensed from standpipe posts remains free of charge, valves were installed to limit waste. Workers ran plastic piping into poor settlements and installed meters for household tanks. Families can have the spigot turn off at 200 liters or pay a metered rate beyond that limit.

The laborious pipe-laying took time, and sanitation lagged even further behind. A cholera outbreak in Durban in 2000, which killed more than 70 people and infected tens of thousands in poor neighborhoods, increased pressure on Macleod's unit to speed up water service and sanitation improvements.

Today, all but 120,000 of Durban's 3.5 million residents have access to clean water—at the very least, within a 200-meter walk. (A decade ago, some residents had to haul water as far as a kilometer.) All households should have water by the end of this year, says Macleod, but it will take 2 more years to make sure everyone has access to a proper toilet. "Water is relatively easy compared to the challenges of sanitation," says Macleod.

To tackle that problem, eThekweni Water is replacing the old "pit toilet" outhouses in many poor neighborhoods. At the time of the

2000 cholera epidemic, there were about 100,000 pit toilets in Durban, which posed disease-transmission problems when they were full. And they often were, because the hilly areas on the outskirts of the city are inaccessible to vacuum tankers that pump out deep pits. In 2003, Durban officials pledged to empty the communal pits every 5 years, and they started to research better options.

The best solution so far is urine-diversion (UD) double-pit toilets, which separate urine from feces to allow the latter to dry and decompose faster. UD toilets have shallower pits and are less costly to empty than conventional pit toilets. During the past few years, eThekweni has replaced nearly 60,000 pit outhouses with UD toilets. The utility also commissioned research into the health and environmental impact of the new toilets. Starting in 2006, eThekweni has given about \$300,000 a year to the Pollution Research Group of the University of KwaZulu-Natal (UKZN) in Durban to study issues such as whether UD solid waste can be used as fertilizer. Early results are promising, says UKZN biologist Mike Smith.

Another project, funded by eThekweni and the World Health Organization, assessed the health benefits of better water and sanitation. For 12 weeks, public health workers surveyed more than 1300 households in Durban's poor areas—half with UD toilets

and half without—questioning each household every 2 weeks and recording episodes of diarrhea, vomiting, worms, and skin infections. Preliminary results suggest a 30% reduction in diarrheal diseases among households with UD toilets compared with similar households using pit toilets, says Stephen Knight of UKZN's Nelson R. Mandela School of Medicine, who worked on the project with eThekweni's environmental health department and the Swedish Institute for Infectious Disease Control. Access to UD toilets helped avert an average of one diarrhea episode per person every 2 years, with the benefits of

good sanitation three times greater for children under age 5 than for other age ranges, according to findings presented at a wastewater management conference last summer.

eThekweni has won wide acclaim and some criticism. Patrick Bond, director of UKZN's Centre for Civil Society, contends that eThekweni's guarantee of a small amount of free water disguises the fact that it has raised water prices for people who use more than the free 200 liters. Many poor people “can't afford to pay the high costs,” Bond says. He also accuses the utility of disconnecting too many customers for not paying their water bills.

eThekweni's deputy head for customer services, Michael Singh, says water policy “has been focused on marginalized and poor communities” and its new debt-relief program forgives past debts if customers meet their monthly bills for 20 months in a row. Although Macleod concedes that water prices have risen, he claims that eThekweni has set a standard among South African cities: “We are on track now to give everyone access to a basic level of services—water and sanitation—within 2 years. Not many other cities on this continent can say that.”

—ROBERT KOENIG

PIPE DREAMS COME TRUE

A big investment in sewer connections in Salvador, Brazil, has led to a steep decline in diarrhea, a major killer of kids

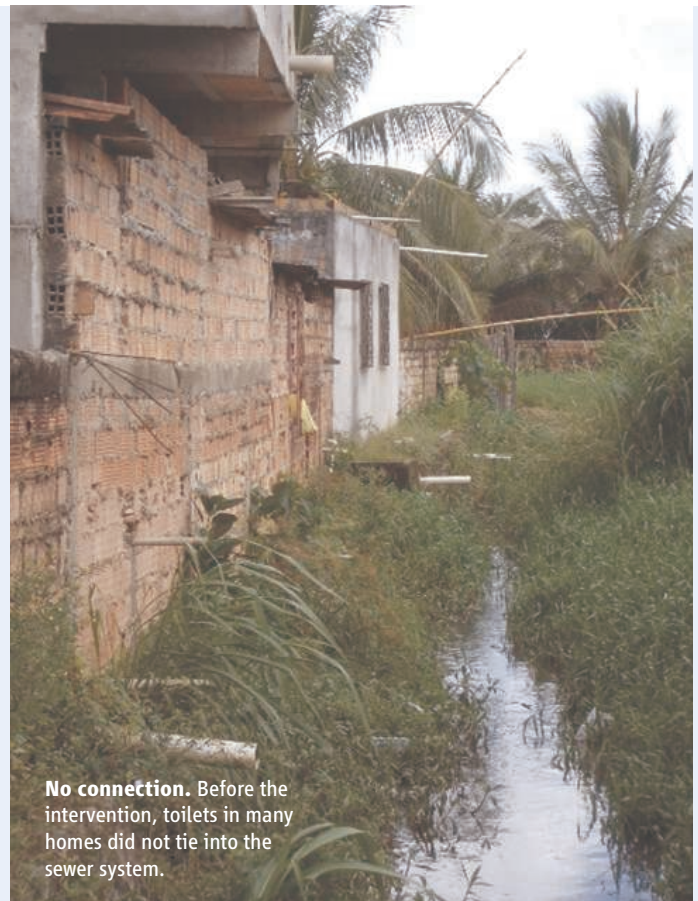
FECES HAPPEN. AND WHEN MILLIONS OF PEOPLE LIVE IN THE SAME city, a lot of it happens every day; and if it isn't properly disposed of, the health of the population goes down the toilet.

Throughout the world, more than 2 billion people lack proper sanitation, which is integrally tied to water supply for both personal hygiene and sewage systems. In all, 1.6 million children die each year from related diarrheal diseases, making it the third leading cause of mortality in children under age 15 in middle- and low-income countries. “Third World cities have a huge internal environmental problem created by fecal contamination that needs to be solved,” says epidemiologist Mauricio Barreto of the Federal University of Bahia in Salvador, Brazil.

Project after project has demonstrated that cleaner water, proper sanitation, and hygiene education can improve the health of communities. Yet few studies have measured the impact of interventions citywide, and none has focused on sanitation, says Barreto. Now, an ambitious project in Salvador that he led claims to have done just that, documenting for the first time the health benefits of expanding sewer systems.

A decade ago in Salvador, 80% of the 2.5 million residents had flush toilets in their homes. Outside of wealthy neighborhoods, however, few toilets were linked to sewers; nearly three-fourths of the residents relied on septic tanks or, more commonly, flushed waste into creeks, streets, and the like. In 1996, the city received a loan from the Inter-American Development Bank and invested about \$220 million in a project that laid 2000 kilometers of sewer pipes for more than 300,000 homes. “Very few cities in the world have made an investment in sanitation on this scale in such a short time,” says Barreto. “We saw it as a great opportunity to see the effects on health.”

As Barreto and co-workers explained in the 10 November 2007 issue of *The Lancet*, they recorded cases of diarrhea in 841 children before the intervention and in 1007 other children after the pipes were laid. The children, who were no more than 3 years old and had similar living conditions in 24 sentinel areas, were followed for more than 6 months by fieldworkers who came to their homes twice a week. Citywide, diarrhea dropped 22%, and it fell 43% in neighborhoods that had the highest diarrheal prevalence before the intervention. Neither the researchers nor the city provided hygiene education, and hygiene behavior did not explain differences in diarrhea prevalence. The study team concluded that the sewage hookups primarily prevented transmission of diarrhea by reducing expo-



No connection. Before the intervention, toilets in many homes did not tie into the sewer system.

sure to feces in the “public domain”—that is, in open sewers. “[The benefit] wasn't dependent on whether your house had a connection,” explains co-author Sandy Cairncross, a water engineer at the London School of Hygiene and Tropical Medicine in the U.K. “It was the extent of coverage of sewers in your neighborhood to which people could connect.”

Demographer Narayan Sastry of the University of Michigan, Ann Arbor, commends the researchers but questions whether the findings will apply elsewhere. He notes that other cities in Brazil have much higher connection rates to sewer systems and that it's easiest to see a dramatic impact in areas where none existed, as in some of the sentinel areas in Salvador.

Brazil's sanitation shortcomings pale, too, in comparison with many

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